

3 Alternatives

The alternative analysis was conducted pursuant to Council on Environmental Quality (CEQ) regulations and Federal Aviation Administration (FAA) guidance provided in FAA Order 1050.1E, Chg. 1, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1E). This chapter discusses the following topics:

- Alternative Development Process
- Alternatives Overview
- Comparison of Alternatives
- Listing of Federal Laws and Regulations

The technical terms and concepts discussed in this chapter are explained in Chapter 1, *Background*.

3.1 Alternative Development Process

The development of an alternative for the North Texas Optimization of Airspace and Procedures in the Metroplex (NTX OAPM) project was a multi-step process that began with the formation of the NTX OAPM Study Team (Study Team). The Study Team was charged with defining operational issues in the North Texas Metroplex and recommending conceptual designs for procedures that would address these issues. The recommended procedures were then provided to the North Texas OAPM Design and Implementation (D&I) Team. The D&I Team were responsible for designing individual procedures based on the Study Team's recommended conceptual procedures. Each procedure designed by the D&I Team was required to meet FAA air traffic procedures design criteria and the project Purpose and Need. As defined in Chapter 2, the need for the Proposed Action is to address existing North Texas Metroplex Standard Instrument Departures (SIDs), Standard Terminal Arrival Routes (STARs), and Standard Instrument Approach Procedures (SIAPs), collectively referred to as Instrument Flight Procedures (IFPs) that are not achieving the higher levels of efficiency found in procedures designed to use Area Navigation (RNAV) technology. The D&I Team rejected individual procedures if, on their own merit, they would not meet the Purpose and Need.

For purposes of the NTX OAPM project, the Proposed Action alternative evaluated in this Environmental Assessment (EA) contains 96 individual procedures combined into one alternative. This group of procedures were considered and evaluated in combination with one another to determine whether the alternative could meet the project's Purpose and Need. The D&I Team considered one or more versions of each proposed air traffic procedure; those that did not meet the objectives of the Purpose and Need of the project were not carried forward for analysis.

The complexity of the operations occurring within the North Texas Metroplex was described in Chapter 1, *Background*, and in Chapter 2, *Purpose and Need* of this document. Given that complexity, the development of proposed changes to instrument procedures must be considered holistically. Otherwise proposed improvements when considered in isolation may be beneficial for one aspect of operations (e.g., arrivals) or geographical area (e.g., northeast corner-post area), or a single airport (e.g., DFW), but may in fact adversely impact overall Metroplex operations. Therefore, the FAA used an iterative process to analyze the

current procedure design as a whole across the Metroplex and developed potential solution elements which were then examined to insure that their implementation would improve overall operations. This iterative process was one which occurred over a period spanning several months. During this period: 1) deficiencies were identified or opportunities were noted; 2) proposed changes were generated; and 3) proposed changes were tested, refined, and recommended or rejected based on their ability to meet design criteria and to realize the opportunities for optimization noted in the *Purpose and Need*.

Together, the Study Team and the D&I Team identified and evaluated potential alternatives to individual procedures. This series of procedures when employed together provided efficiency to the NTX Metroplex and became the Proposed Action. The following sections describe in additional detail the alternative development process the FAA used to create a series of procedures that when employed together would add efficiency to the NTX Metroplex.

3.1.1 North Texas OAPM Study Team

In September 2010, the NTX OAPM Study Team began work to define operational problems in the North Texas Metroplex and to identify potential solutions. The Study Team included experts on the Air Traffic Control (ATC) system. The work completed was intended to provide a guide for later design efforts by the D&I Team. The Study Team met with and obtained input from local FAA facilities, airspace users (e.g., pilots), and aviation industry representatives to learn more about the challenges of operating in the North Texas Metroplex. These meetings helped identify operational challenges related to individual procedures and potential solutions that would increase efficiency. Initially, the Study Team identified over 105 issues related to existing procedures in the North Texas Metroplex. As the Study Team identified additional issues, they were grouped together into 17 generalized categories based on similarity.

Next the Study Team identified potential designs for arrival and departure procedures that would address the identified issues. The modifications proposed were conceptual in nature, and did not include a detailed technical assessment, which was reserved for the D&I Team. The final set of Study Team recommendations was documented in the Study Team Final Report.³⁴

3.1.2 North Texas OAPM Design and Implementation Team

Following completion of the Study Team's Final Report in March 2011, the D&I Team began work on the procedure designs in July 2011. First, the Study Team proposals were prioritized based on complexity, interdependencies with other procedures, and degree of potential benefit to the Metroplex. Second, the D&I Team set up workgroups to further develop and refine the Study Team proposals into preliminary designs. Finally, the preliminary designs were brought to the whole D&I Team for review and modification, if necessary.

The D&I Team adopted, refined, rejected, and added to the proposal elements recommended by the Study Team. Airspace users and environmental specialists were regularly engaged for feedback throughout deliberations.

³⁴ NTX OAPM Study Team Final Report, March 2011.

In developing the proposed procedures, the D&I Team was responsible for following regulatory and technical guidance as well as meeting criteria and standards in three general categories:

- **RNAV Design Criteria and Air Traffic Control Regulatory Requirements** - Flight procedure design is subject to requirements found in several FAA Orders, including FAA Order 7100.9D, Standard Terminal Arrival Program and Procedures, FAA Order 8260.43, Flight Procedures Management Program, FAA Order JO 7110.65U, Air Traffic Control, FAA Order 1050.1E Policies and Procedures for Considering Environmental Impacts. The Guidelines for Implementing Terminal RNAV Procedures, to be followed in conjunction with the requirements of FAA Order 8260.43, includes an “18-Step Process” for developing, reviewing, and implementing RNAV procedures. In addition, FAA Order JO 7110.65U includes requirements governing air traffic control procedures, air traffic management, and appropriate technical terminology.
- **Operational Criteria** – Operational criteria were consistent with the Purpose and Need for the project and included: 1) increasing efficiency, 2) increasing flexibility, and 3) decreasing complexity in air traffic management. The criteria were measured for all procedures using a full motion simulator, a stationary simulator, and/or flight training devices. The flight simulations helped ensure that aircraft could fly the procedure as designed and that efficiency (e.g., ATC and pilot workload) would not be limited by the proposed procedures. The criteria were also measured for many procedures using real time Human-In-The-Loop Simulations (HITLs). The HITLs assisted in validating that the proposed route structure was functional.
- **Safety Factors** – Procedures were subject to evaluation using the FAA’s Air Traffic Organization’s (ATO’s) Safety Management System (SMS). The SMS is the ATO’s system for managing the safety of ATC and navigation services in the National Airspace System (NAS). In compliance with SMS requirements, the procedures were evaluated by a Safety Risk Management Panel (SRMP) following a five step process: 1) describe the system; 2) identify the hazards in the system; 3) analyze the risks; 4) assess the risk; and, 5) mitigate the risk. If a procedure introduced a new hazard or increased the severity and/or likelihood of an existing hazard that is being mitigated, the design was adjusted to reduce the hazard to acceptable levels.

To ensure that procedures included in the Proposed Action were viable, the D&I team undertook validation exercises that further refined the procedures. Over a multi-month period, the D&I Team worked to further refine the procedures and meet Final Design milestones. To reach the milestones, the D&I Team relied on the use of design solution tools (e.g., design and testing software), and applied the criteria described above. The combined final procedure designs have been brought forward in this EA as the Proposed Action alternative.

To illustrate the iterative process, the following two sections are examples of unique procedures considered by the D&I Team that were either modified or eliminated from further consideration.

3.1.2.1 Study Team Recommendation: MOTZA/SLUGG Arrival

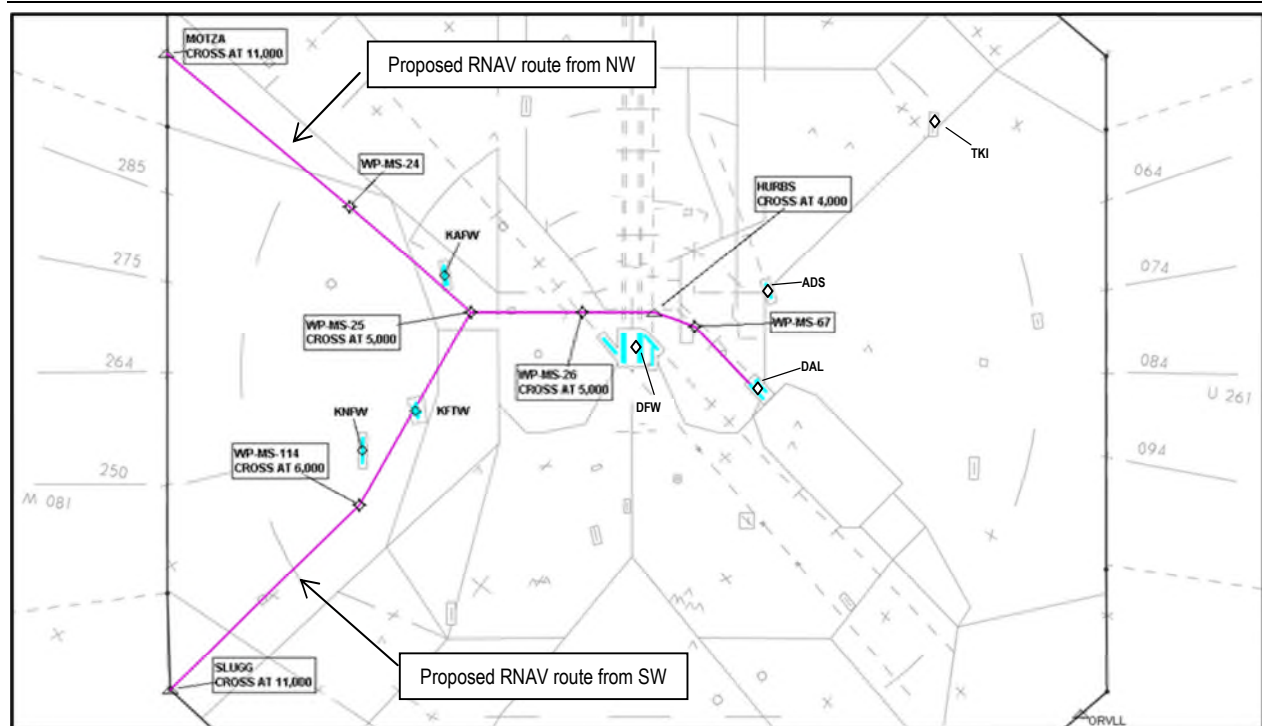
The NTX Study Team recommended three DAL RNAV STARs from MOTZA and SLUGG waypoints. The Study Team's recommendations were designed to create an RNAV version of what pilots commonly refer to as the "over the top/slam dunk".

The "over the top/slam dunk" starts in the southwest corner of D10's airspace via the GLEN ROSE NINE STAR and crosses over the top of DFW in a South Flow, only for landing at DAL/ADS/TKI. During periods of high traffic volume, high winds or inclement weather, DAL/ADS/TKI arrivals are routinely taken off of the GLEN ROSE NINE STAR and given the KNEAD SIX STAR.

From the northwest corner of D10's airspace, there is also an informal route that is routinely requested by pilots, that goes over the top of DFW (commonly referred to by pilots as the "reverse slam dunk") for landing at DAL. High traffic volume, high winds and inclement weather may prevent the reverse slam dunk from being issued and DAL arrivals will be given the GREGS SIX STAR.

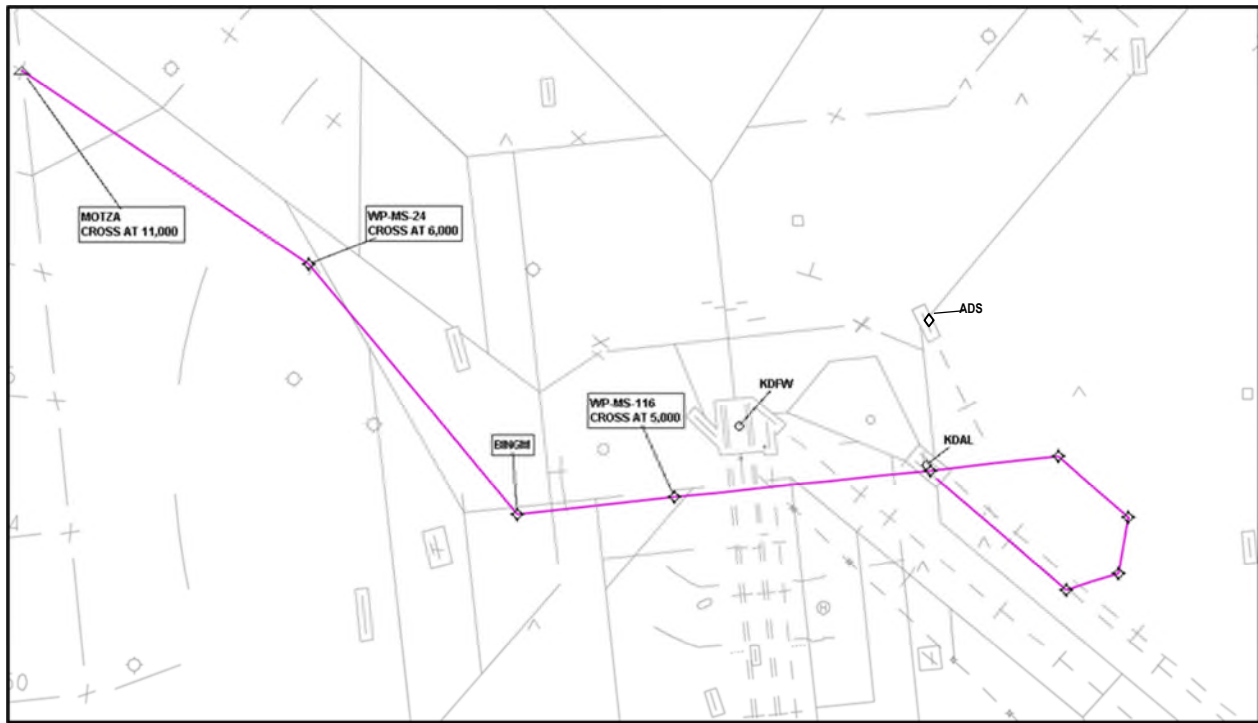
The Study Team proposed two RNAV STARs, one starting at MOTZA waypoint and one starting at SLUGG waypoint in a South flow. These procedures merged west of DFW into a single stream, and then crossed north of DFW as depicted in **Exhibit 3-1**. A third RNAV STAR was proposed starting at MOTZA waypoint in a North flow. This procedure followed a similar track to that of the south flow MOTZA procedure, except that it passed south of DFW and east of DAL, then tear-dropped back into DAL, as depicted in **Exhibit 3-2**.

Exhibit 3-1 Study Team MOTZA/SLUGG Concept – South Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

Exhibit 3-2 Study Team MOTZA Concept – North Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

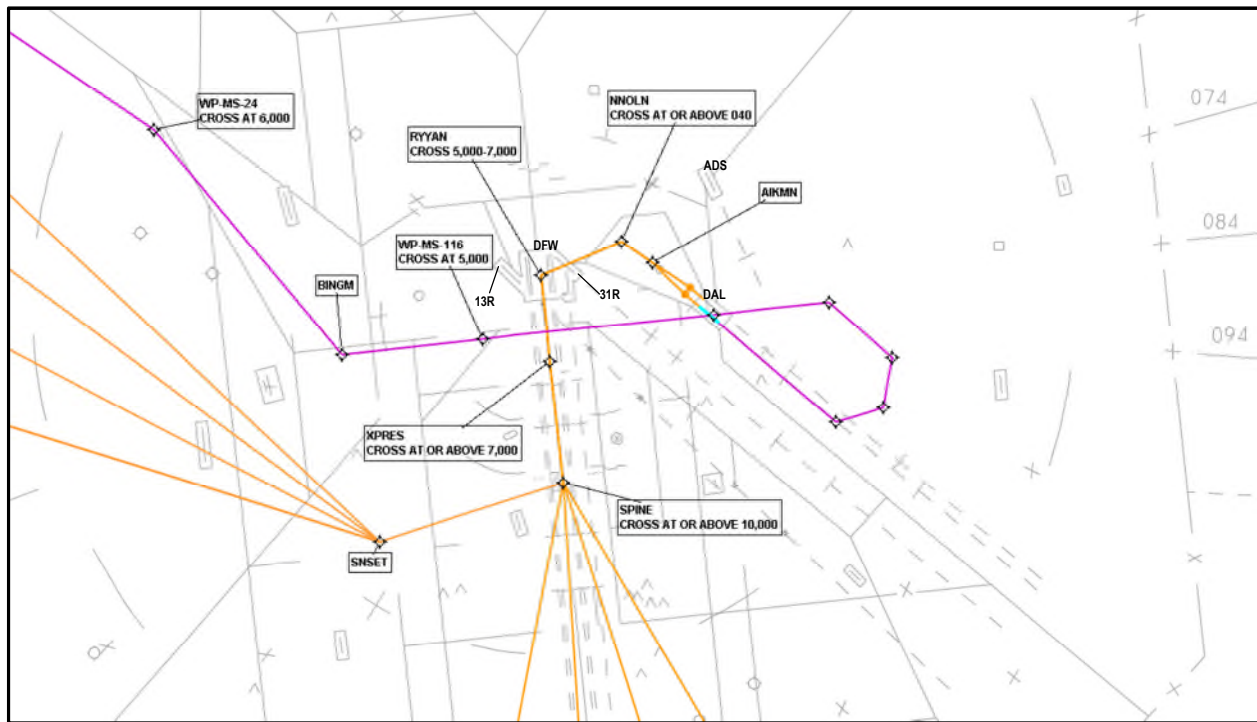
The Study Team recommendations were not based on any flight simulation evaluations, but based on Industry input. The D&I Team identified concerns with the MOTZA/SLUGG merge in a south flow. First, the proposed altitude at the MOTZA/SLUGG merge point was 5,000 ft., which would be in direct conflict with propeller traffic from the southwest and turbojet traffic from the southeast corners arriving runway 13R at DFW. This would force the MOTZA/SLUGG merge traffic to lower altitudes, which would create additional conflicts with AFW, NFW and FTW arrivals and departures. It would also create mission impact to military aircraft operating at NFW by delaying high-performance climbing military departures and high arrivals. Second, there were concerns regarding the sequencing of DAL arrivals at the merge point because of inadequate airspace to allow for vectored sequencing, and the available traffic metering³⁵ tool is insufficient for automatic sequencing the MOTZA/SLUGG merge. As a result of this impact to safety and efficiency the proposed MOTZA/SLUGG RNAV STARs in south flow was not carried forward for further evaluation of the proposed action.

The D&I Team then looked at the proposed MOTZA RNAV STAR in north flow. The Team identified concerns regarding potential conflicts with the proposed DAL south bound and west bound SIDs that turn south over DFW. Slow climbing DAL departure aircraft on high temperature days could pose a potential conflict with DAL arrivals crossing south of DFW as shown in **Exhibit 3-3**. The proposed altitudes on the east side of DAL would also pose concerns for propeller arrivals from the northwest corner arriving runway 31R at DFW.

³⁵ METERING- A method of time-regulating arrival traffic flow into a terminal area so as not to exceed a predetermined terminal acceptance rate. (P/CG)

Finally, the tear-drop on the east side of DAL would increase congestion on the east side downwind with both DAL arrivals from the northeast corner and for ADS arrivals from the southeast and southwest corners. As a result of these potential impacts to safety and efficiency the proposed MOTZA RNAV STAR in North flow was not carried forward for further evaluation in the proposed action.

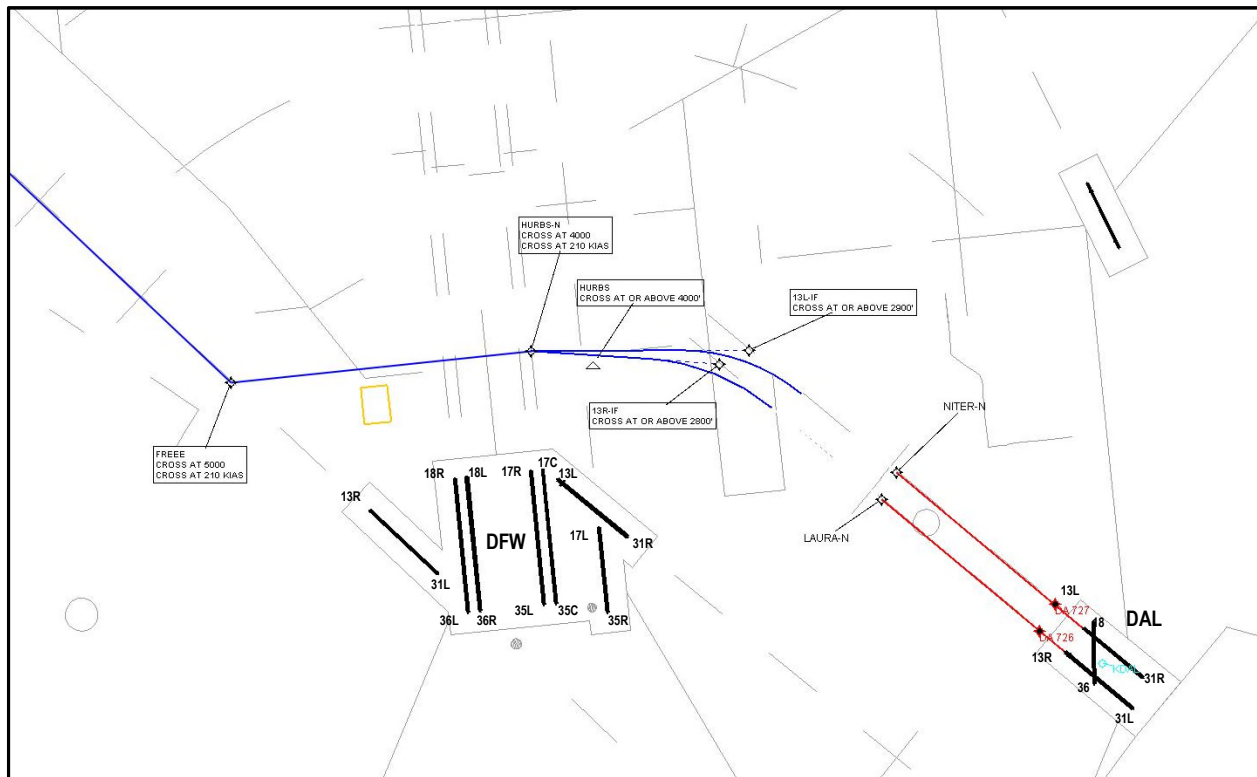
Exhibit 3-3 DAL Departure and Arrival Conflicts – MOTZA North Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

The D&I Team made minor refinements to the Study Team's proposed MOTZA RNAV STAR in a south flow. Specifically, it modified the lateral track from MOTZA waypoint to eliminate concerns with northwest corner arrivals to Runway 13R at DFW. Industry representatives expressed a desire to tie this RNAV STAR to the proposed RNP-AR procedures at DAL. By doing so, arrivals would no longer cross the HURBS intersection at or above 4,000 ft. mean sea level (MSL) as they do today, but at a lower altitude as shown in **Exhibit 3-4**. The D&I Team concluded that this lower altitude would cause a safety concern with the go-around/missed approach altitudes for Runway 17L arrivals at DFW, because DFW Tower requires 2,000 and 3,000 ft. MSL altitudes for missed approaches. These altitudes are required to ensure separation between aircraft operating from Runways 17 L/C/R and 18 L/R due to the close proximity of the runways to one another. The option of lowering the approach altitudes for Runway 17L was not deemed viable by the D&I Team because it would limit the availability of visual approaches to that runway. As a result of these concerns, the proposed MOTZA RNAV STAR in south flow was not carried forward for further evaluation in the proposed action.

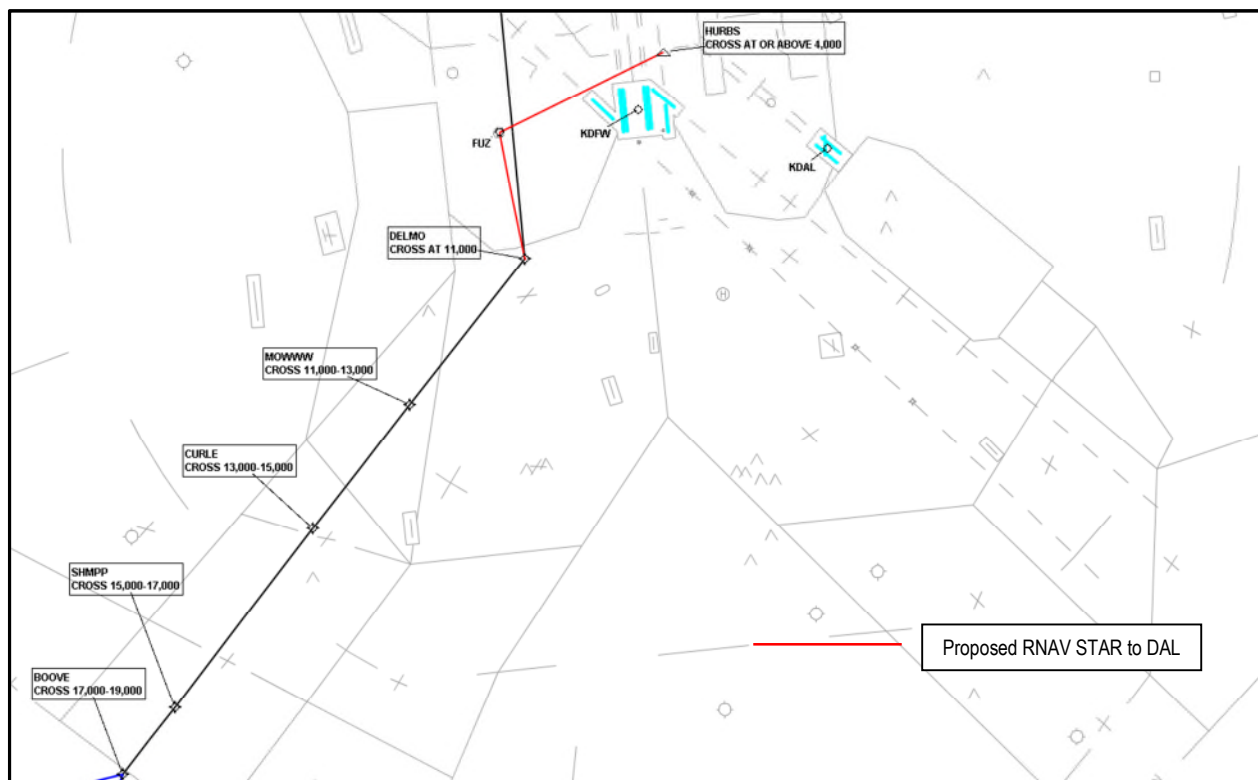
Exhibit 3-4 D&I MOTZA modification – South Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

In an attempt to provide an over the top capability for DAL arrivals from the southwest corner, the D&I Team proposed a modification to the SLUGG RNAV STAR that would mirror the GLEN ROSE NINE STAR flown today in a south flow. The D&I Team proposed to not segregate the DAL and DFW arrival streams and instead designed a procedure where DAL arrivals mirror the proposed DFW RNAV STAR in south flow, and then go over the top north of DFW as shown in **Exhibit 3-5**. The proposed RNAV STAR would require the DAL arrivals to cross HURBS at or above 4,000 ft. MSL as they do today. Industry representatives flew this proposed procedure in their simulator and determined it resulted in an unstable approach even with no tailwind component. Due to the unstable approach, this modified RNAV STAR was not carried forward for further evaluation in the proposed action.

Exhibit 3-5 D&I SLUGG modification – South Flow



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

3.1.2.2 Study Team Recommendation: KATTZ vs. CEOLA

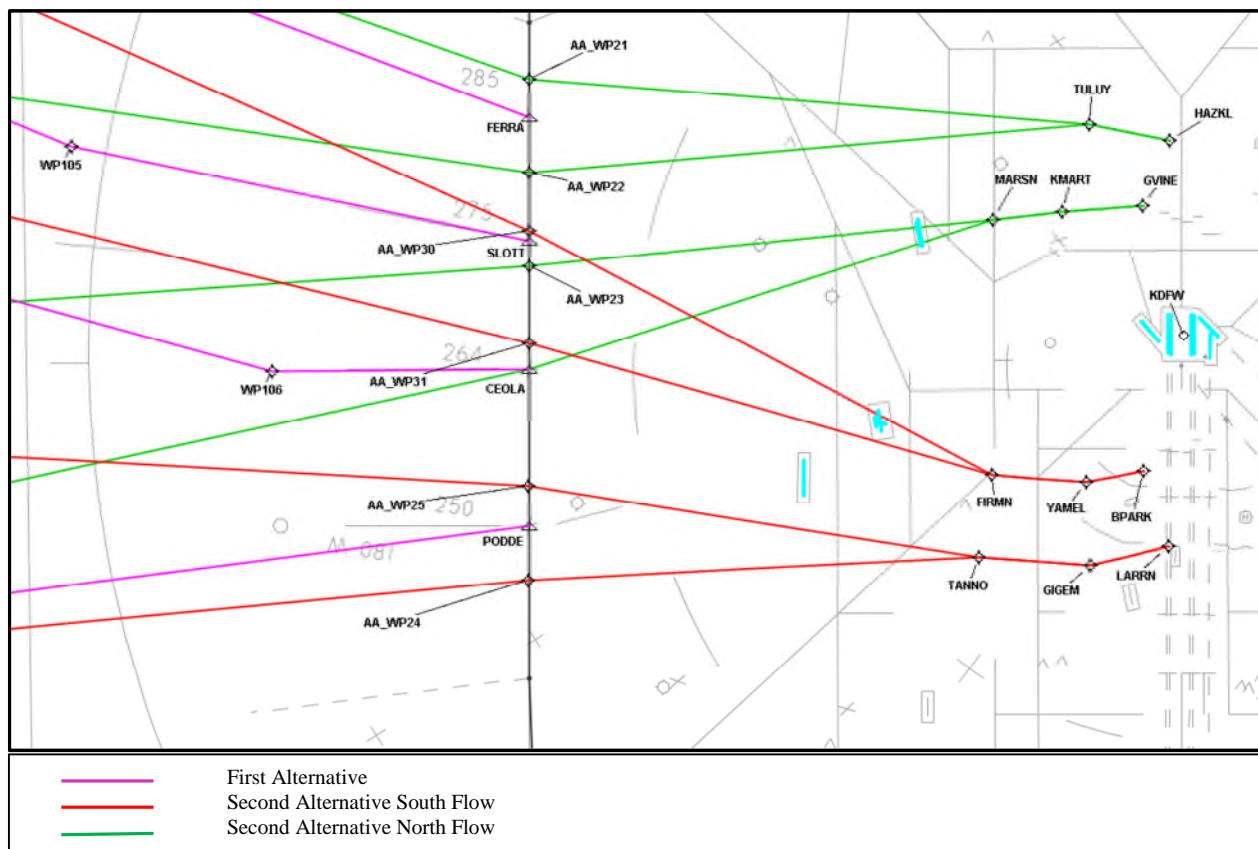
The Study Team proposed two alternatives for the DFW RNAV westbound SIDs: KATTZ and CEOLA. The published SIDs contain doglegs that are typically short-cut by air traffic controllers. Redesigning the SIDs to reflect the route that is actually flown would result in shorter distances flown.

The current RNAV SIDs have the departure exit points fairly evenly spaced across the western edge of the D10 airspace. As a result some of the traffic in either flow travels away from the desired flight path for number of miles before being turned back to its desired course.

The first alternative modified the existing CEOLA SID utilizing the existing exit points and reducing the extent of the doglegs. The first alternative is illustrated by the fuchsia tracks

The second alternative utilized a floating fix concept, which required flow-specific departure exit points that would decrease track miles for departures within the terminal airspace and remove the doglegs inside en route airspace. In the floating fix concept the exit points are specific to the flow of DFW; in the south flow the fixes are compressed to the south while the opposite is true in the north flow. Under this design the traffic is allowed a more direct route to its desired course. For alternative two, the green tracks indicate the north flow and red tracks indicate the south flow. Both designs are shown in **Exhibit 3-6**.

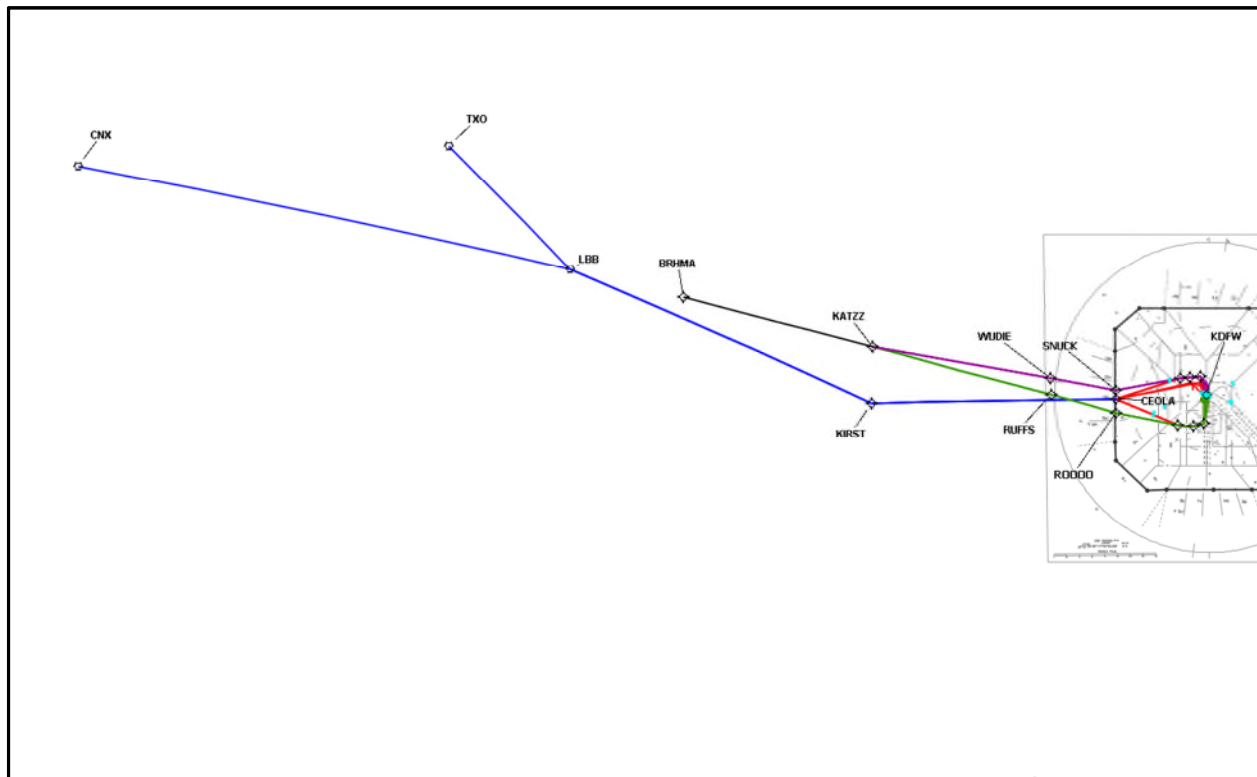
Exhibit 3-6 Current Static Fix Concept and the Study Team Floating Fix Concept



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

D&I determined that the floating fix concept was the more efficient alternative and then further shortened the CEOLA SID transitions to allow for more direct routings to destination airports from the end of the SIDs. The revised SID, called KATTZ, was carried forward into the Proposed Action. Both the KATZZ SID (green in south flow; purple in north flow) and the existing CEOLA SID (in blue) are depicted in **Exhibit 3-7**.

Exhibit 3-7 Current CEOLA SID and Final KATZZ SID



Sources: MITRE Inc., August 2013
Prepared by: MITRE Inc., August 2013.

3.2 Alternatives Overview

The following sections discuss the Proposed Action and the No Action Alternative, the two alternatives carried forward for analysis in the EA.

3.2.1 No Action Alternative

Under the No Action Alternative, the procedures in use in the North Texas Metroplex as of 2011 (representing existing conditions) would generally remain the same. The only modification from today would be a change to the DUMPY FOUR arrival serving both DFW and DAL. This modification would correct ground tracks of arriving aircraft to account for historical wind drift. This change would be independent of the Proposed Action and would be implemented in the absence of the Proposed Action.

The factors that lower the level of efficiency of the North Texas metroplex are identified in Section 2.1.2. In summary, the factors are:

- Lack of flexibility for the efficient transfer of traffic between the en route and terminal area airspace;
- Complex converging interactions between arrival and departure flight paths; and
- Lack of predictable standard procedures to/from and in en route airspace.

3.2.1.1 No Action Alternative Standard Procedures

Table 3-1 lists the names of the No Action Alternative procedures, the procedure type (i.e., SID or STAR), the basis of design (indicated by the type of navigational aid the procedures are based on: NAVAID (shown as VHF Omnidirectional Range [VOR]), RNAV, or radar vectors), and the airports served. In addition, the table includes the number of runway and en route transitions for each procedure and, where applicable, by airport, and the entry/exit points served by the procedure. The No Action Alternative includes current procedures, as well as procedures with independent utility that are expected to be put into effect prior to the implementation of the North Texas OAPM.

Table 3-1 No Action Alternative SIDs and STARs (1 of 1)

| No Action Alternative Procedure | Procedure Type | Basis of Design | Airport Served | Transitions (En Route / Runway) | Exit/Entry Point Served |
|---------------------------------------|-------------------|--------------------|--------------------------|---------------------------------------|----------------------------|
| AKUNA FOUR | SID | RNAV | DFW | 1/8 | North |
| ARDIA FOUR | SID | RNAV | DFW | 2/10 | South |
| BACHMAN SIX | SID | VOR | DAL | 9/0 | East |
| BLECO FIVE | SID | RNAV | DFW | 2/10 | North |
| BONHAM SIX | STAR | VOR | DFW | 6/0 | Northeast |
| BOWIE TWO | STAR | VOR | DFW / DAL | 7/2 | Northwest |
| CEDAR CREEK SEVEN | STAR | VOR | DFW | 4/0 | Southeast |
| CEOLA FIVE | SID | RNAV | DFW | 3/0 | West |
| CLARE THREE | SID | RNAV | DFW | 2/0 | East |
| COYOTE FIVE | SID | VOR | DFW / DAL | 10/0 | West |
| DALLAS NINE | SID | VOR | DFW / DAL / SATs | 9/0 | East |
| DARTZ FOUR | SID | RNAV | DFW | 3/8 | South |
| DODJE FOUR | STAR | VOR | SATs | 13/0 | Southeast |
| DUMPY FOUR | STAR | VOR | DFW / DAL / East SATs | 13/0 | Southeast |
| FERRA FIVE | SID | RNAV | DFW | 2/0 | West |
| FINGER FOUR | STAR | VOR | DAL / East SATs | 8/0 | Northeast |
| GARLAND THREE | SID | VOR | DFW / DAL / SATs | 6/0 | East |
| GLEN ROSE NINE | STAR | VOR | DFW / DAL / East SATs | 2/0 | Southwest |
| GRABE FIVE | SID | RNAV | DFW | 2/8 | North |
| GREGS SIX | STAR | VOR | DAL / East SATs | 7/0 | Northwest |
| HUBBARD SIX | SID | VOR | DFW / DAL / SATs | 6/0 | East |
| JACKY FIVE | SID | VOR | DFW | 0/0 | West |
| JAGGO THREE | STAR | VOR | DFW | 0/0 | Southeast |
| JASPA THREE | SID | RNAV | DFW | 1/8 | South |

| No Action Alternative Procedure | Procedure Type | Basis of Design | Airport Served | Transitions (En Route / Runway) | Exit/Entry Point Served |
|--|---------------------------|----------------------------|-----------------------|--|------------------------------------|
| JONEZ FIVE | STAR | VOR | DFW / ADS | 0/0 | Northeast |
| JOE POOL FIVE | SID | VOR | DFW / DAL / SATs | 11/0 | South |
| JUMBO THREE | STAR | VOR | DFW | 2/0 | Southwest |
| KEENE SIX | SID | VOR | DFW | 0/0 | Southwest |
| KINGDOM SEVEN | SID | VOR | DFW / DAL / SATs | 4/0 | West |
| KNEAD SIX | STAR | VOR | DAL / East SATs | 8/0 | Southwest |
| KRUMM FOUR | SID | VOR | DAL | 10/0 | North |
| LOVE TWO | SID | VOR | DAL | 11/0 | West |
| LOWGN FIVE | SID | RNAV | DFW | 2/10 | North |
| MASTY TWO | STAR | VOR | DFW | 4/0 | Northwest |
| MOTZA SEVEN | STAR | VOR | West SATs | 9/0 | Northwest |
| NELYN THREE | SID | RNAV | DFW | 3/8 | South |
| NOBLY FOUR | SID | RNAV | DFW | 1/0 | East |
| PODDE FOUR | SID | RNAV | DFW | 2/0 | West |
| SASIE THREE | STAR | VOR | West SATs | 7/0 | Northeast |
| SLOTT FIVE | SID | RNAV | DFW | 3/0 | West |
| SLUGG SIX | STAR | VOR | West SATs | 7/0 | Southwest |
| SOLDO THREE | SID | RNAV | DFW | 3/0 | East |
| TEXOMA TWO | SID | VOR | DFW / DAL / SATs | 11/0 | North |
| TRI-GATE SIX | SID | VOR | DFW | 0/0 | Northeast / Southwest |
| TRINITY SIX | SID | VOR | DAL | 0/0 | South |
| TRISS FOUR | SID | RNAV | DFW | 1/0 | East |
| VENUS SEVEN | SID | VOR | DAL | 9/0 | South |
| WILBR THREE | STAR | VOR | DFW | 5/0 | Northeast |
| WORTH SEVEN | SID | VOR | DFW / DAL / SATs | 11/0 | West |
| WYLIE FIVE | SID | VOR | DFW / DAL / SATs | 9/0 | East |

Notes:

DAL – Dallas Love Field Airport

SATs – Satellite Airports

DFW – Dallas / Ft. Worth International Airport

SID – Standard Instrument Departure

STAR – Standard Terminal Arrival Route

RNAV – Area Navigation

VOR - VHF Omnidirectional Range

Sources: MITRE Inc., July 2013

Prepared by: Harris Miller Miller & Harris Inc., July 2013

Under the No Action Alternative, the final approach flows to and initial departure flows from the runways at all the Study Airports are similar to Existing Conditions (2011). For a few airports, the location of landing thresholds on the runways will change as a result of

independent projects due to capital improvements.³⁶ These changes are taken into account in the analysis of impacts associated with the No Action Alternative (See Chapter 5, *Environmental Consequences*.)

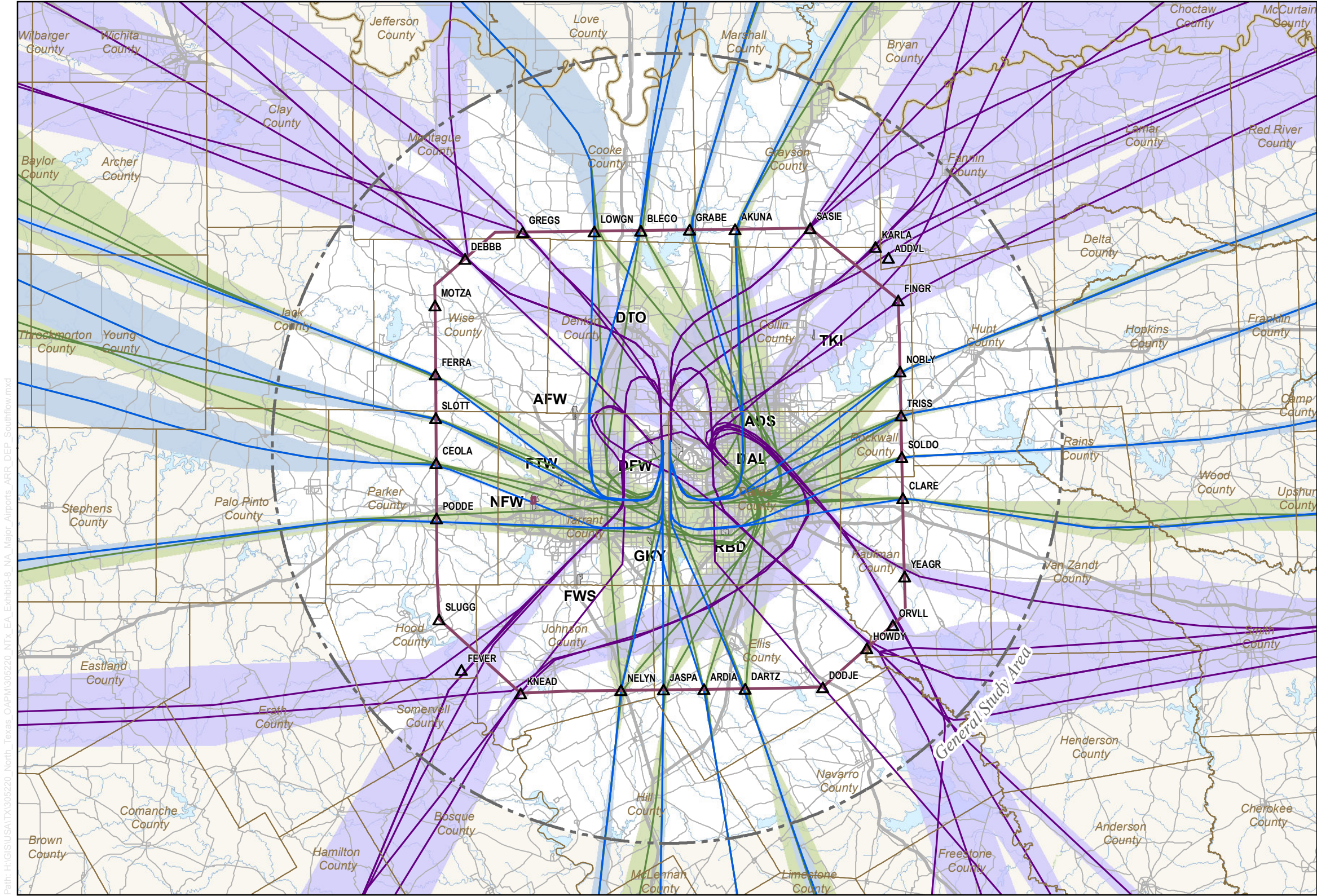
3.2.1.2 Airspace Control Structure under the No Action Alternative

When aircraft depart or arrive on an assigned route in the North Texas Metroplex, control over the aircraft is transferred between the Fort Worth Air Route Traffic Control Center (ARTCC) (ZFW) and the Dallas/Fort Worth (DFW) Terminal Radar Approach Control (TRACON) (D10). The entry and exit points between the North Texas Metroplex airspace and the ZFW Center would remain the same as under Existing Conditions (2011). **Exhibits 2-1 and 2-4** in Chapter 2 depict the locations of the entry and exit points for the North Texas Metroplex airspace, respectively. The entry and exit points associated with each procedure are shown in **Table 3-1**.

Exhibit 3-8 and **Exhibit 3-9** show all arrival and departure flows to the major Study Airports (DFW and DAL) associated with the No Action Alternative during South Flow and North Flow conditions, respectively. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Arrival and departure corridors to/from the satellite Study Airports are shown on **Exhibit 3-10**.

Exhibit 3-11 and **Exhibit 3-12** depict the arrival and departure corridors to/from the DFW and DAL under South Flow conditions, respectively. Similarly, **Exhibit 3-13** and **Exhibit 3-14** depict the arrival and departure corridors to/from the major Study Airports under North Flow conditions, respectively. **Exhibit 3-15** and **Exhibit 3-16** depict arrivals and departures to the satellite Study Airports, respectively.

³⁶ Collin County Regional Airport at McKinney (TKI) in 2012 constructed a new runway to the east of the existing one to bring it up to airport design standards. The existing runway was closed and converted into a taxiway. Fort Worth Alliance Airport (AFW) is extending both parallel runways to the north. The runways will be 11,000' long and are expected to be complete in 2016.



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (RNAV)
- No Action Arrival Flow (Conventional)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-11 and 3-12

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

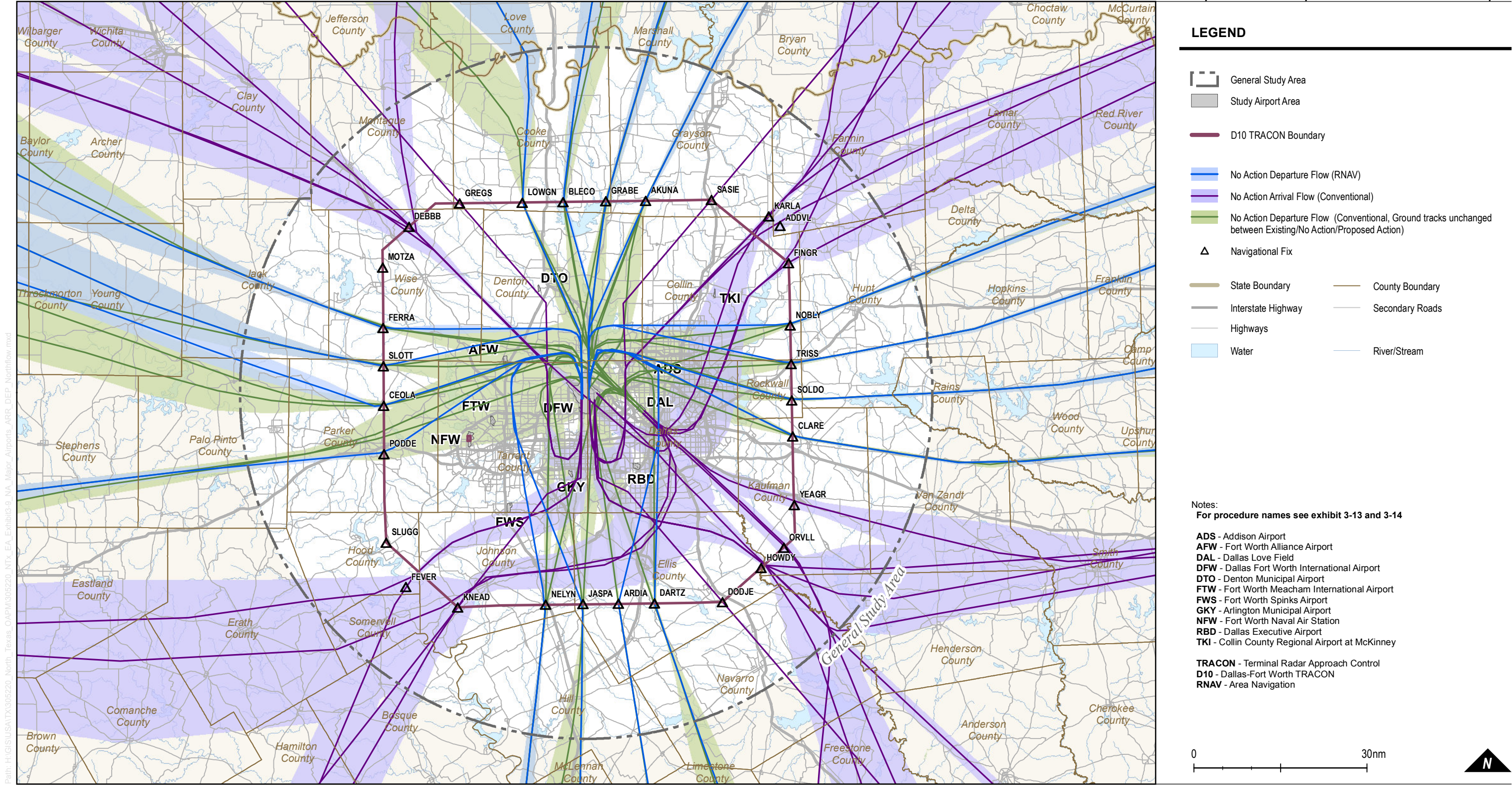
TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

0 30nm



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

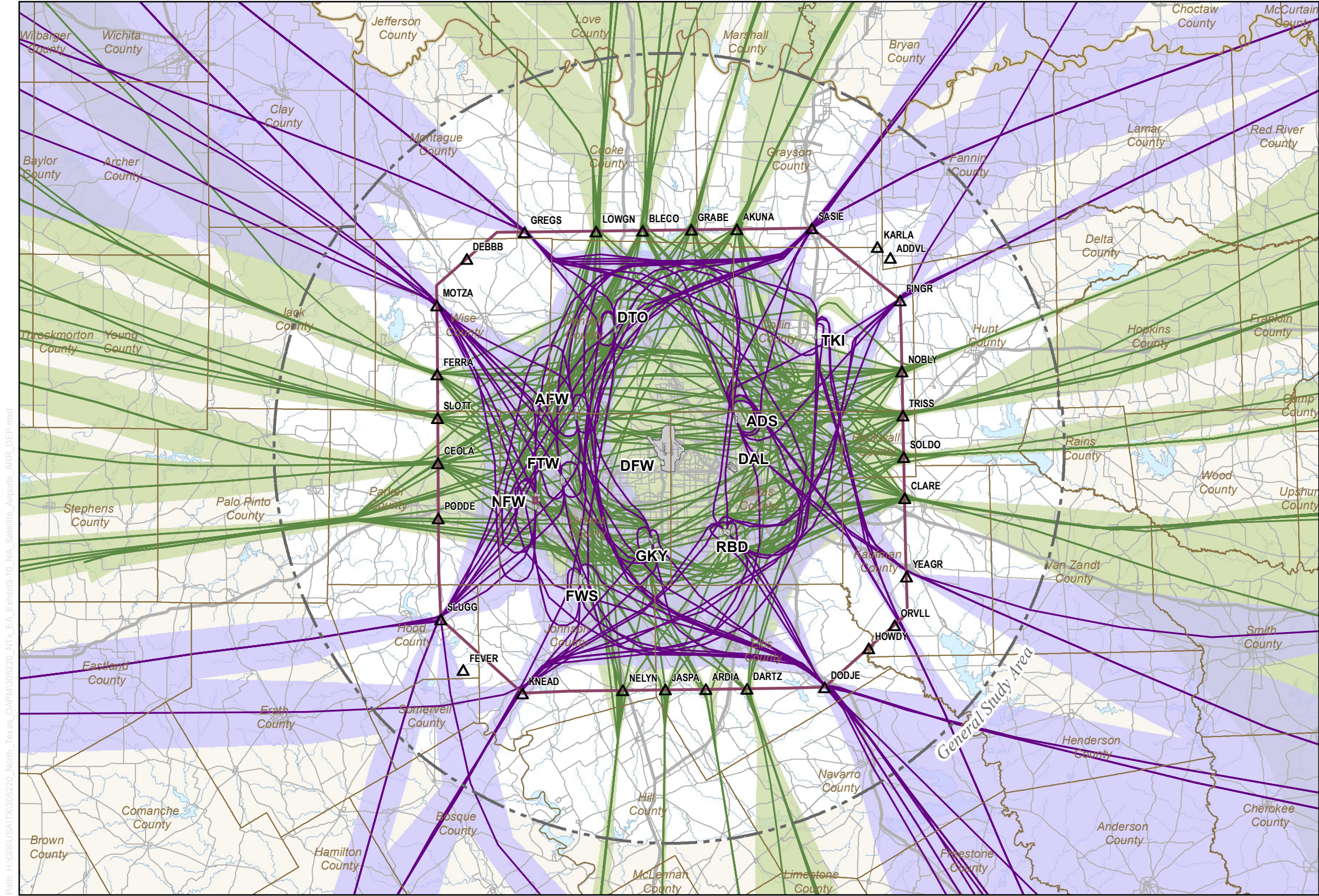
Exhibit 3-8



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-9

No Action Alternative
Major Study Airports Arrivals and
Departures North Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Arrival Flow (Conventional)
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-15 and 3-16

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

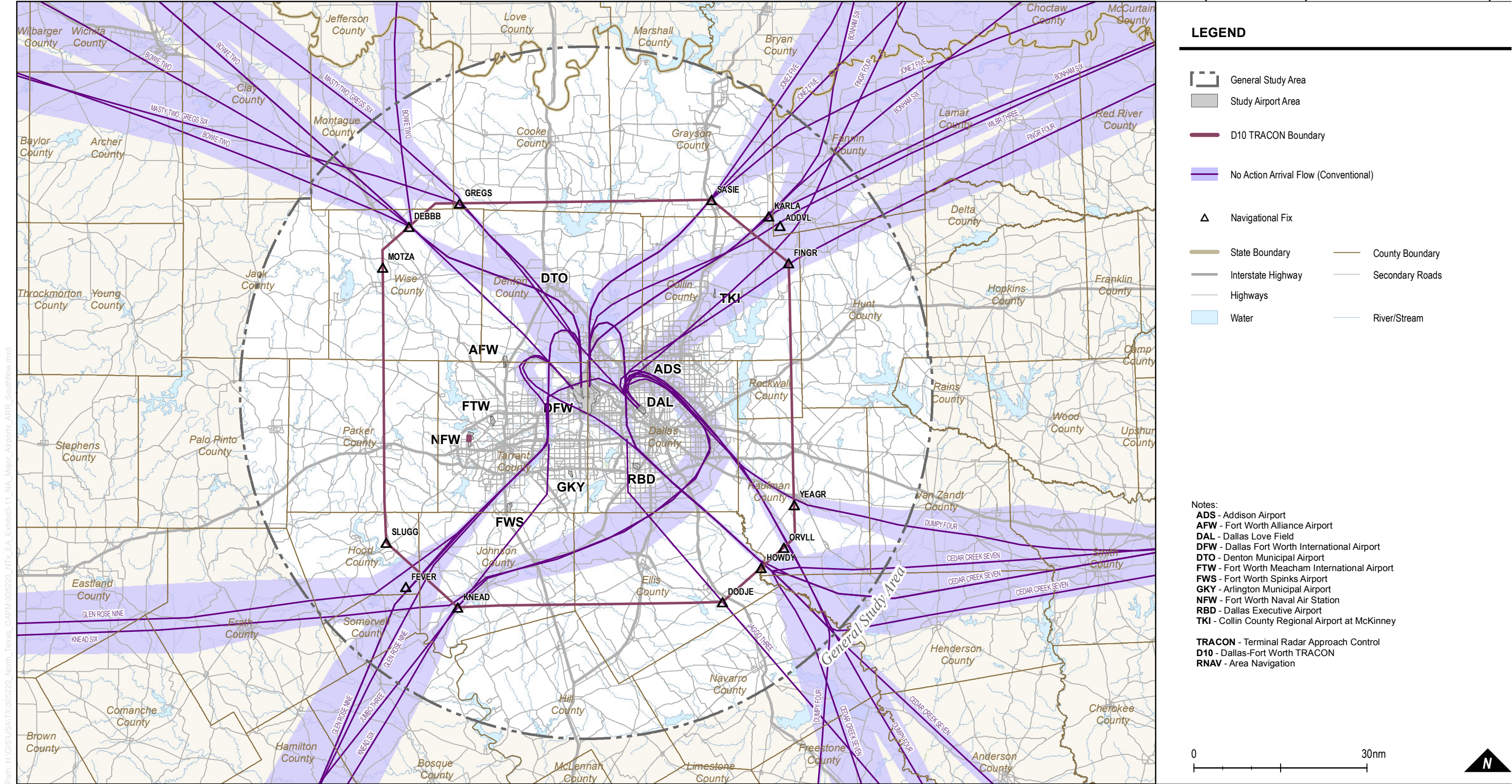
TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

0 30nm



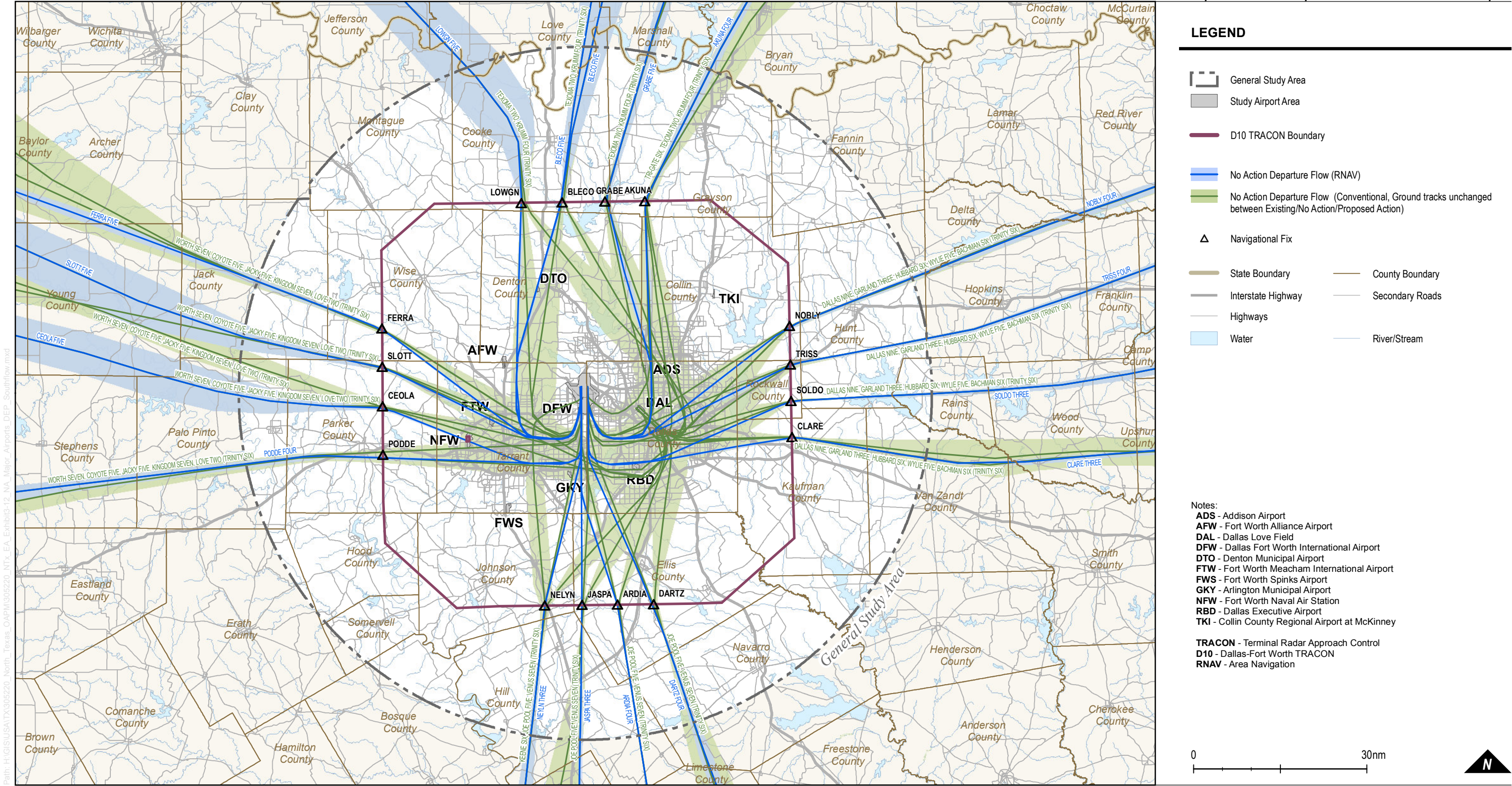
Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-10



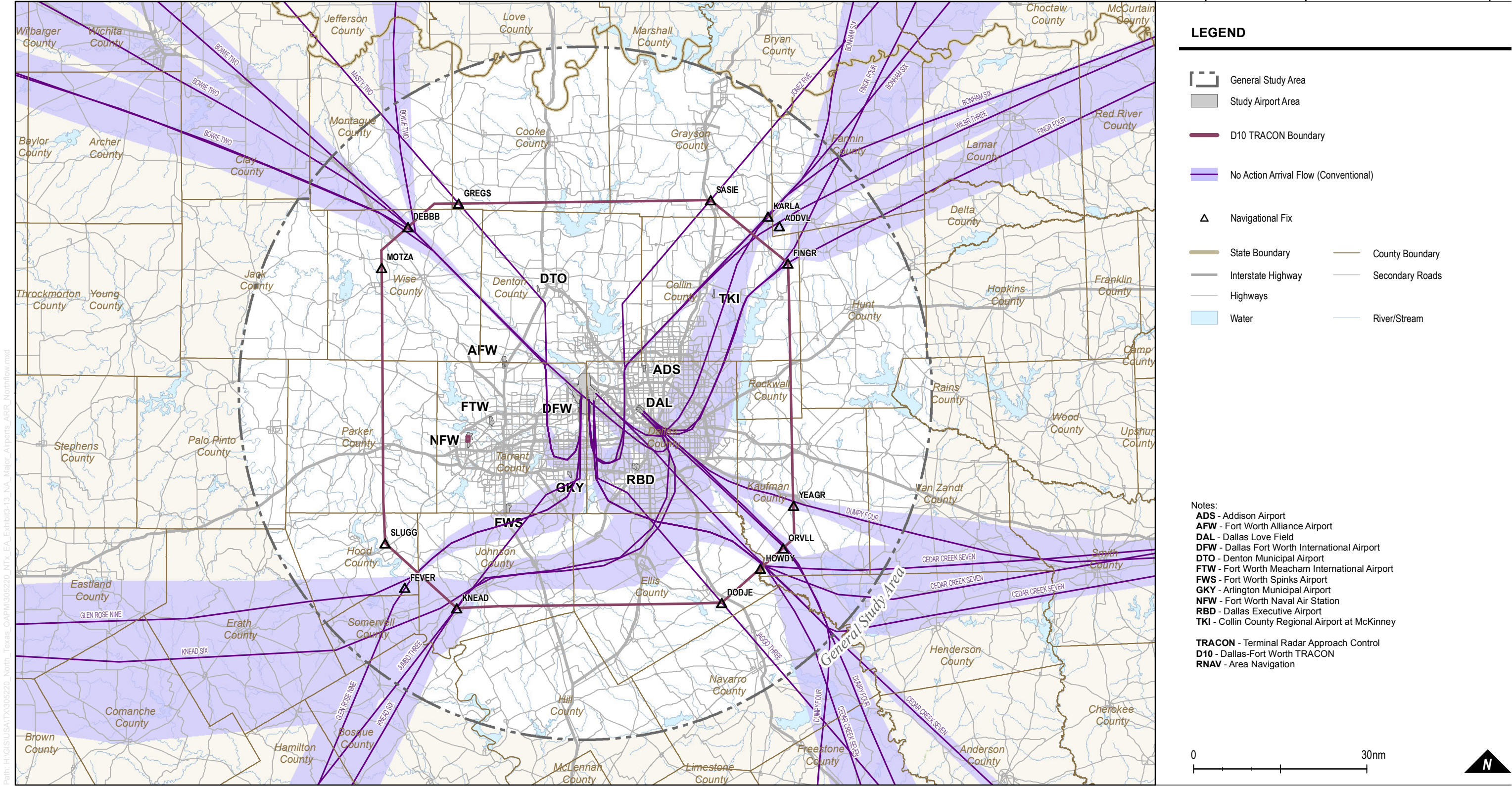
Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-11



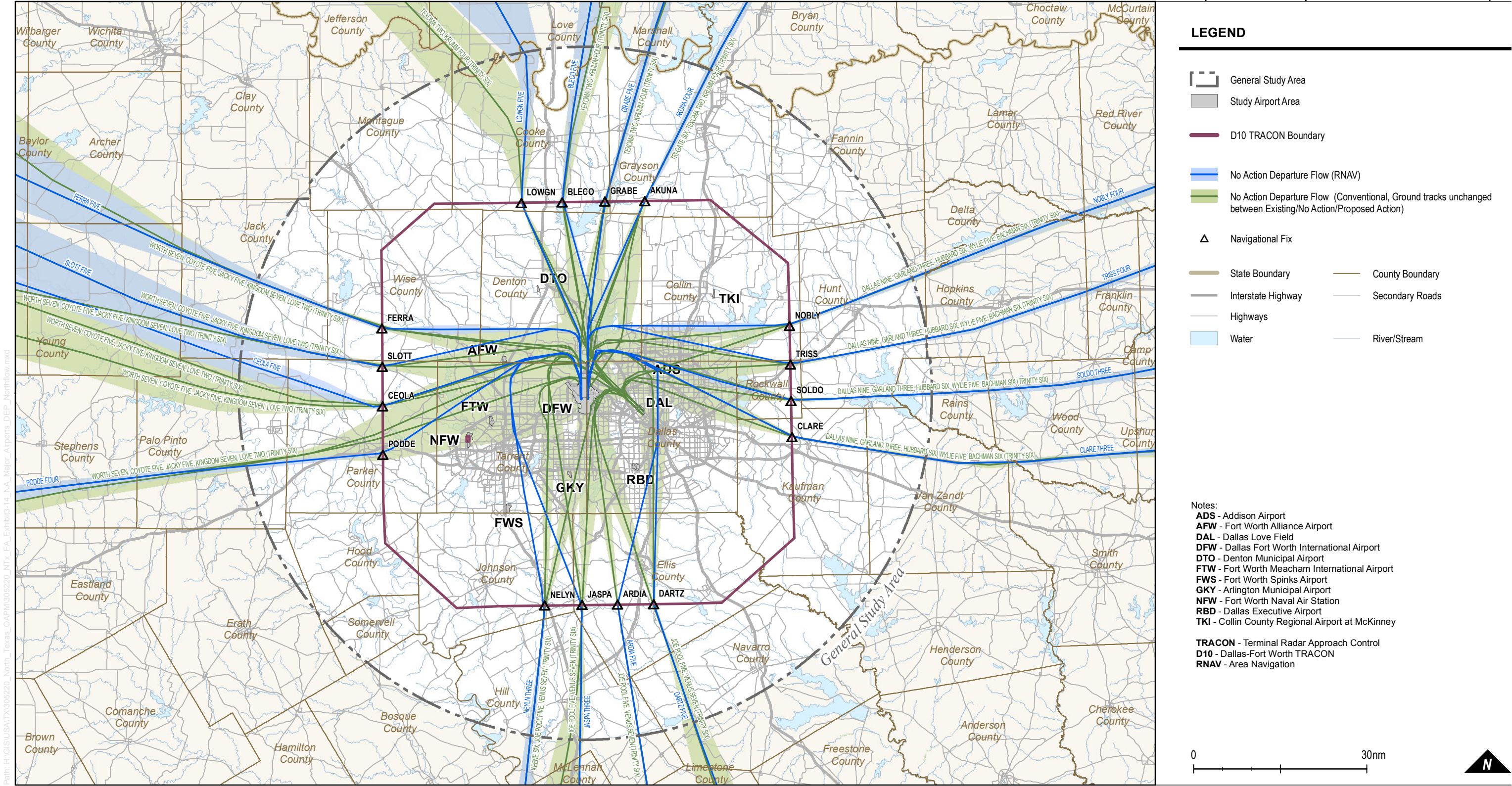
Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-12



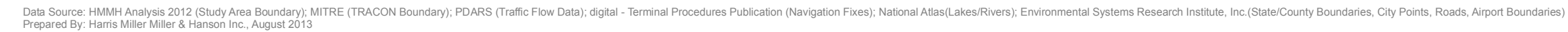
Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

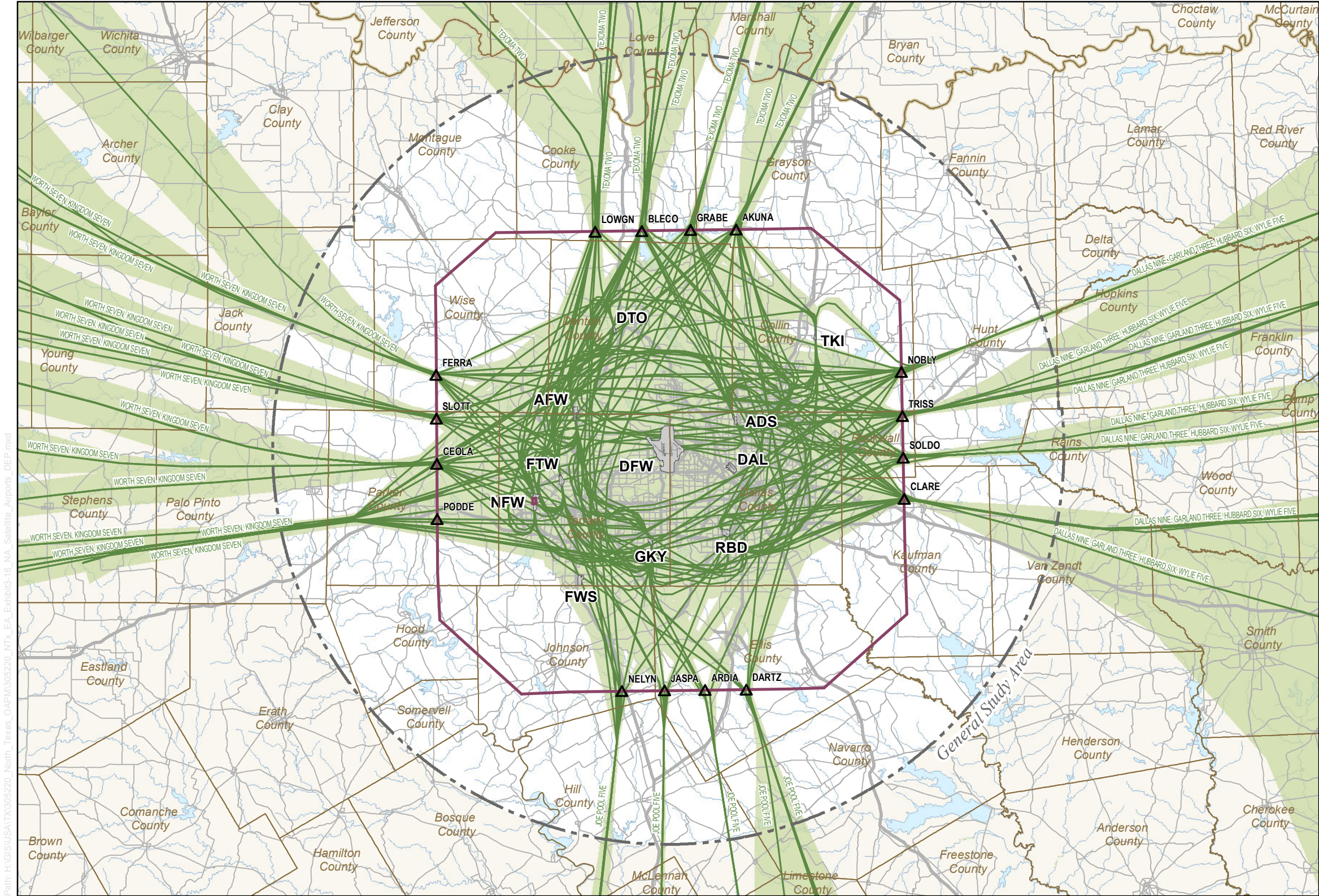
Exhibit 3-13



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-14



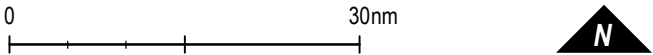


LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- No Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigation Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- River/Stream
- Water

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

3.2.2 Proposed Action Alternative

As discussed in Section 3.1, the Proposed Action includes the combined Proposed Final Designs for all procedures developed by the D&I Team as well as existing procedures that have been carried forward for continued use. This alternative is expected to add efficiency to airspace usage in the North Texas Metroplex by improving flexibility in transitioning aircraft, segregating arrivals and departures, and improving the predictability of air traffic flows.

The Proposed Action includes 96 procedures: 60 new procedures, 15 modified procedures developed by the D&I Team, and 21 existing procedures. In some cases, the D&I Team determined that existing procedures are efficient and a redesign was unnecessary.³⁷ Of the 60 new procedures developed by the D&I Team, 21 procedures are RNAV SIDs, 32 are RNAV STARs, one is a conventional STAR, and 6 are RNP-ARs. Out of the 15 modified procedures 8 were RNAV SIDs and 7 were conventional STARs.

Table 3-2 lists the names of the Proposed Action procedures, the corresponding No Action procedures, the procedure type, and the basis of design (indicated by the type of navigational aid the procedures are based on: NAVAID [shown as VOR, RNAV, or radar vectors]). In addition, the table also shows the airports served by the Proposed Action procedures, the number of runway and en route transitions for each procedure and, where applicable, by airport, and the entry/exit points served by the procedure. Finally, the table lists intent of the procedure, including the objectives identified under the purpose and need for the project (predictability, flexibility and/ segregation) that each procedure design achieves. New or updated SIDs and STARs are shaded in gray.

Exhibit 3-17 and **Exhibit 3-18** show all arrival and departure flows to the major Study Airports associated with the Proposed Action during South Flow and North Flow conditions, respectively. Corridors are grouped by procedure type (conventional or RNAV), operation (arrival or departure), and airport. Arrival and departure corridors to/from the satellite Study Airports are shown on **Exhibit 3-19**.

Exhibit 3-20 and **Exhibit 3-21** depict the arrival and departure corridors to/from the major Study Airports under South Flow conditions, respectively. Similarly, **Exhibit 3-22** and **Exhibit 3-23** depict the arrival and departure corridors to/from the major Study Airports under North Flow conditions, respectively. **Exhibit 3-24** and **Exhibit 3-25** depict arrivals and departures to the satellite Study Airports, respectively.

³⁷ More information on the procedure designs can be found in The Design and Implementation Team Final Report for the North Texas Metroplex, August 2013. http://oapmenvironmental.com/ntx_metroplex/ntx_docs.html

Table 3-2 Procedures Under the Proposed Action Alternative (1 of 4)

| Proposed Action Procedure | No Action Alternative Procedure | Procedure Type | Basis of Design | Airport Served | Transitions (En Route / Runway) | Exit / Entry Point Served | Objective |
|----------------------------------|--|-----------------------|------------------------|-----------------------|--|----------------------------------|------------------------------------|
| AKUNA FIVE | AKUNA FOUR | SID | RNAV | DFW | 1/8 | North | De-confliction |
| ALIAN ONE | No Procedure | SID | RNAV | DFW | 1/8 | West | Flexibility |
| ARDIA FIVE | ARDIA FOUR | SID | RNAV | DFW | 2/10 | South | De-confliction |
| BACHMAN SIX | BACHMAN SIX | SID | VOR | DAL(Night) | 9/0 | East | Retention for Conventionals |
| BACHR ONE | KNEAD SIX | STAR | RNAV | DAL | 4/0 | Southwest (South Flow) | Segregation & Predictability |
| BAWLZ ONE | JAGGO THREE | STAR | RNAV | DFW (Dual) | 4/0 | Southeast (North Flow) | Flexibility |
| BLECO SIX | BLECO FIVE | SID | RNAV | DFW | 2/10 | North | De-confliction |
| No Procedure | BONHAM SIX | STAR | VOR | DFW | N/A | Northeast | Deletion |
| BOOVE ONE | GLEN ROSE NINE | STAR | RNAV | DFW | 4/0 | Southwest (South Flow) | Segregation & Predictability |
| BOWIE THREE | BOWIE TWO | STAR | VOR | DFW | 7/2 | Northwest | Overlay of RNAV STAR |
| BRDJE ONE | BONHAM SIX & WILBR THREE | STAR | RNAV | DFW | 6/0 | Northeast (North Flow) | Predictability |
| CABBY ONE | JAGGO THREE | STAR | RNAV | DFW (Dual) | 4/0 | Southeast (South Flow) | Flexibility |
| CAINE ONE | JONEZ FIVE | STAR | RNAV | DFW (Dual) | 4/0 | Northeast (North Flow) | Flexibility |
| CEDAR CREEK EIGHT | CEDAR CREEK SEVEN | STAR | VOR | DFW | 4/0 | Southeast | Segregation & Overlay of RNAV STAR |
| No Procedure | CEOLA FIVE | SID | RNAV | DFW | N/A | West | Deletion |
| CHUKK ONE | DUMPY FOUR | STAR | RNAV | East SATs | 4/0 | Southeast (South Flow) | Segregation & Predictability |
| No Procedure | CLARE THREE | SID | RNAV | DFW | N/A | East | Deletion |
| COYOTE FIVE | COYOTE FIVE | SID | VOR | DFW / DAL | 10/0 | West | Retention for Conventionals |
| CURLO ONE | JOE POOL FIVE | SID | RNAV | DAL | 4/13 | South (South Flow) | Predictability |
| DALLAS NINE | DALLAS NINE | SID | VOR | DFW / DAL / SATs | 9/0 | East | Retention for Conventionals |
| DAMNS ONE | WORTH SEVEN | SID | RNAV | SATs | 6/2 | West (North Flow) | Predictability |
| DARTZ FIVE | DARTZ FOUR | SID | RNAV | DFW | 3/8 | South | De-confliction |
| DAWGZ ONE | JONEZ FIVE | STAR | RNAV | DFW (Dual) | 4/0 | Northeast (South Flow) | Flexibility |
| DEBBB ONE | BOWIE TWO | STAR | RNAV | DFW | 6/0 | Northwest (South Flow) | Segregation & Predictability |
| DODJE FOUR | DODJE FOUR | STAR | VOR | West SATs | 13/0 | Southeast | Retention for Conventionals |
| No Procedure | DUMPY FOUR | STAR | VOR | DFW / DAL / East SATs | N/A | Southeast | Deletion |
| EESAT ONE | DUMPY FOUR | STAR | RNAV | East SATs | 4/0 | Southeast (North Flow) | Segregation & Predictability |
| EMMIT ONE | DALLAS NINE | SID | RNAV | DAL | 5/4 | East (North Flow) | Predictability |
| ESNYE ONE | TEXOMA TWO | SID | RNAV | DAL | 12/4 | North (North Flow) | Predictability |
| No Procedure | FERRA FIVE | SID | RNAV | DFW | N/A | West | Deletion |
| FINGR FIVE | FINGR FOUR | STAR | VOR | DAL / East SATs | 8/0 | Northeast | Overlay of RNAV STAR |

| Proposed Action Procedure | No Action Alternative Procedure | Procedure Type | Basis of Design | Airport Served | Transitions (En Route / Runway) | Exit / Entry Point Served | Objective |
|----------------------------------|--|-----------------------|------------------------|-----------------------|--|-------------------------------------|------------------------------|
| FORCK ONE | SOLDO THREE | SID | RNAV | DFW | 1/8 | East | Predictability |
| GARLAND THREE | GARLAND THREE | SID | VOR | DFW / DAL / SATs | 6/0 | East | Retention for Conventionals |
| GIBBI ONE | MASTY TWO | STAR | RNAV | DFW (Dual) | 5/0 | Northwest (North Flow) | Flexibility |
| GLEN ROSE ONE | GLEN ROSE NINE | STAR | VOR | DFW / DAL / East SATs | 2/0 | Southwest | Overlay of RNAV STAR |
| GRABE SIX | GRABE FIVE | SID | RNAV | DFW | 2/8 | North | De-confliction |
| GREGS SEVEN | GREGS SIX | STAR | VOR | DAL / East SATs | 7/0 | Northwest | Overlay of RNAV STAR |
| HIBIL ONE | FINGR FOUR | STAR | RNAV | DAL | 8/0 | Northeast (South Flow) | Segregation & Predictability |
| HRPER ONE | SLOTT FIVE | SID | RNAV | DFW | 1/8 | West | Predictability |
| HUBBARD SIX | HUBBARD SIX | SID | VOR | DFW / DAL / SATs | 6/0 | East | Retention for Conventionals |
| HUDAD ONE | FERRA FIVE | SID | RNAV | DFW | 1/8 | West | Predictability |
| JACKY FIVE | JACKY FIVE | SID | VOR | DFW | 0/0 | West | Retention for Conventionals |
| No Procedure | JAGGO THREE | STAR | VOR | DFW | N/A | Southeast | Deletion |
| JASPA FOUR | JASPA THREE | SID | RNAV | DFW | 1/8 | South | De-confliction |
| JFRYE ONE | GREGS SIX | STAR | RNAV | DAL / East SATs | 5/0 | Northwest (South Flow for DAL only) | Segregation & Predictability |
| No Procedure | JONEZ FIVE | STAR | VOR | ADS / DFW (Dual) | N/A | Northeast | Deletion |
| JOVEM ONE | BOWIE TWO | STAR | RNAV | DFW | 6/2 | Northwest (North Flow) | Segregation & Predictability |
| JOE POOL FIVE | JOE POOL FIVE | SID | VOR | DFW / DAL / SATs | 11/0 | South | Retention for Conventionals |
| No Procedure | JUMBO THREE | STAR | VOR | DFW | N/A | Southwest | Deletion |
| KATZZ ONE | CEOLA FIVE | SID | RNAV | DFW | 1/8 | West | Predictability |
| KEENE SIX | KEENE SIX | SID | VOR | DFW | 0/0 | Southwest | Retention for Conventionals |
| KINGDOM SEVEN | KINGDOM SEVEN | SID | VOR | DFW / DAL / SATs | 4/0 | West | Retention for Conventionals |
| KKITY ONE | WORTH SEVEN | SID | RNAV | DAL | 7/4 | West (South Flow) | Predictability |
| KNEAD SIX | KNEAD SIX | STAR | VOR | DAL / East SATs | 8/0 | Southwest | Retention for Conventionals |
| KLNDR ONE | CEDAR CREEK SEVEN | STAR | RNAV | DFW | 4/0 | Southeast (South Flow) | Segregation & Predictability |
| KRUMM FOUR | KRUMM FOUR | SID | VOR | DAL (Night) | 11/0 | West | Retention for Conventionals |
| KUSSO ONE | WYLIE FIVE | SID | RNAV | SATs | 5/1 | East (South Flow) | Predictability |
| LEEAG ONE | WYLIE FIVE | SID | RNAV | SATs | 5/1 | East (North Flow) | Predictability |
| LIKES ONE | SLUGG SIX | STAR | RNAV | West SATs | 5/0 | Southwest | Segregation & Predictability |
| LNDRE ONE | DALLAS NINE | SID | RNAV | DAL | 5/4 | East (South Flow) | Predictability |
| LOVE TWO | LOVE TWO | SID | VOR | DAL (Night) | 11/0 | West | Retention for Conventionals |
| LOWGN SIX | LOWGN FIVE | SID | RNAV | DFW | 2/10 | North | De-confliction |
| No Procedure | MASTY TWO | STAR | VOR | DFW | N/A | Northwest | Deletion |

| Proposed Action Procedure | No Action Alternative Procedure | Procedure Type | Basis of Design | Airport Served | Transitions (En Route / Runway) | Exit / Entry Point Served | Objective |
|--|--|---------------------------|----------------------------|---------------------------|--|--|---------------------------------|
| MNND0 ONE | DUMPY FOUR | STAR | RNAV | DAL | 5/0 | Southeast (North Flow) | Segregation & Predictability |
| MOTZA SEVEN | MOTZA SEVEN | STAR | VOR | West SATs | 9/0 | Northwest | Retention for Conventionals |
| MRSSH ONE | CLARE THREE | SID | RNAV | DFW | 2/10 | East | Predictability |
| NANDR ONE | GREGS SIX | STAR | RNAV | DAL | 5/0 | Northwest (North Flow) | Segregation & Predictability |
| NELYN FOUR | NELYN THREE | SID | RNAV | DFW | 3/8 | South | De-confliction |
| No Procedure | NOBLY FOUR | SID | RNAV | DFW | N/A | East | Deletion |
| NRTAY ONE | KNEAD SIX | STAR | RNAV | DAL | 4/0 | Southwest (North Flow) | Segregation & Predictability |
| PAWLZ ONE | JUMBO THREE | STAR | RNAV | DFW (Dual) | 2/0 | Southwest (North Flow) | Segregation & Predictability |
| No Procedure | PODDE FOUR | SID | RNAV | DFW | N/A | West | Deletion |
| RAMBL ONE | JOE POOL FIVE | SID | RNAV | DAL | 13/4 | South (North Flow) | Predictability |
| REDDN ONE | DUMPY FOUR | STAR | RNAV | DAL | 4/0 | Southeast (South Flow) | Segregation & Predictability |
| REEKO ONE | DODJE FOUR | STAR | RNAV | West SATs | 4/0 | Southeast | Segregation & Predictability |
| RNP-AR | No Procedure | RNP-AR | RNP | DAL | 0/6 | All | Predictability |
| SANGR ONE | SASIE THREE | STAR | RNAV | West SATs | 5/0 | Northeast | Segregation & Predictability |
| SASIE FOUR | SASIE THREE | STAR | VOR | West SATs & ADS | 7/0 | Northeast | Overlay of RNAV STAR |
| SEAVR ONE | BONHAM SIX & WILBR THREE | STAR | RNAV | DFW | 6/0 | Northeast (South Flow) | Predictability |
| SHAAM ONE | MASTY TWO | STAR | RNAV | DFW (Dual) | 5/0 | Northwest (South Flow) | Flexibility |
| SKTER ONE | NOBLY FOUR | SID | RNAV | DFW | 1/8 | East | Predictability |
| SLANT ONE | FINGR FOUR | STAR | RNAV | East SATs | 8/0 | Northeast | Segregation & Predictability |
| No Procedure | SLOTT FIVE | SID | RNAV | DFW | N/A | West | Deletion |
| SLUGG SIX | SLUGG SIX | STAR | VOR | West SATs | 7/0 | Southwest | Retention for Conventionals |
| SNSET ONE | WORTH FIVE | SID | RNAV | DAL | 7/4 | West (North Flow) | Predictability |
| SOCKK ONE | GLEN ROSE NINE | STAR | RNAV | DFW | 4/0 | Southwest (North Flow) | Segregation & Predictability |
| No Procedure | SOLDO THREE | SID | RNAV | DFW | N/A | East | Deletion |
| SWABR ONE | WORTH SEVEN | SID | RNAV | SATs | 6/1 | West (South Flow) | Predictability |
| SWTSR ONE | TEXOMA TWO | SID | RNAV | DAL | 12/4 | North (South Flow) | Predictability |
| SWVAY ONE | KNEAD SIX | STAR | RNAV | East SATs | 4/0 | Southwest | Segregation & Predictability |
| TEXOMA TWO | TEXOMA TWO | SID | VOR | DFW / DAL / SATs | 11/0 | North | Retention for Conventionals |
| TILLA ONE | JUMBO THREE | STAR | RNAV | DFW (Dual) | 2/0 | Southwest (South Flow) | Flexibility |
| TRI-GATE SIX | TRI-GATE SIX | SID | VOR | DFW | 0/0 | Northeast/So uthwest | Retention for Conventionals |
| TRINITY SIX | TRINITY SIX | SID | VOR | DAL (Night) | 0/0 | South | Retention for Conventionals |
| No Procedure | TRISS FOUR | SID | RNAV | DFW | N/A | East | Deletion |
| TRYST ONE | FINGR FOUR | STAR | RNAV | DAL | 8/0 | Northeast | Segregation & |

**Environmental Assessment for North Texas
Optimization of Airspace and Procedures in the Metroplex**

| Proposed Action Procedure | No Action Alternative Procedure | Procedure Type | Basis of Design | Airport Served | Transitions (En Route / Runway) | Exit / Entry Point Served (North Flow) | Objective |
|--|--|---------------------------|----------------------------|---------------------------|--|--|---------------------------------|
| TRYTN ONE | TRISS FOUR | SID | RNAV | DFW | 1/8 | East | Predictability |
| VENUS SEVEN | VENUS SEVEN | SID | VOR | DAL (Night) | 9/0 | South | Predictability |
| WESAT ONE | MOTZA SEVEN | STAR | RNAV | West SATs | 4/0 | Northwest | Retention for Conventionals |
| WHINY ONE | CEDAR CREEK SEVEN | STAR | RNAV | DFW | 4/0 | Southeast (North Flow) | Segregation & Predictability |
| WILBR FOUR | WILBR THREE | STAR | VOR | DFW | 5/0 | Northeast | Segregation & Predictability |
| WORTH SEVEN | WORTH SEVEN | SID | VOR | DFW / DAL / SATs | 11/0 | West | Overlay of RNAV STAR |
| WSTEX ONE | PODDE FOUR | SID | RNAV | DFW | 2/8 | West | Retention for Conventionals |
| WYLIE FIVE | WYLIE FIVE | SID | VOR | DFW / DAL / SATs | 9/0 | East | Predictability |
| YEAGR ONE | DUMPY FOUR | STAR | VOR | DAL / East SATs | 8/0 | Southeast | Retention for Conventionals |
| | | | | | | | Segregation |

Notes:

DAL – Dallas Love Field Airport

DFW – Dallas / Ft. Worth International Airport

SID – Standard Instrument Departure

RNAV – Area Navigation

SATs – Satellite Airports

ADS – Addison Airport

STAR – Standard Terminal Arrival Route

VOR - VHF Omnidirectional Range

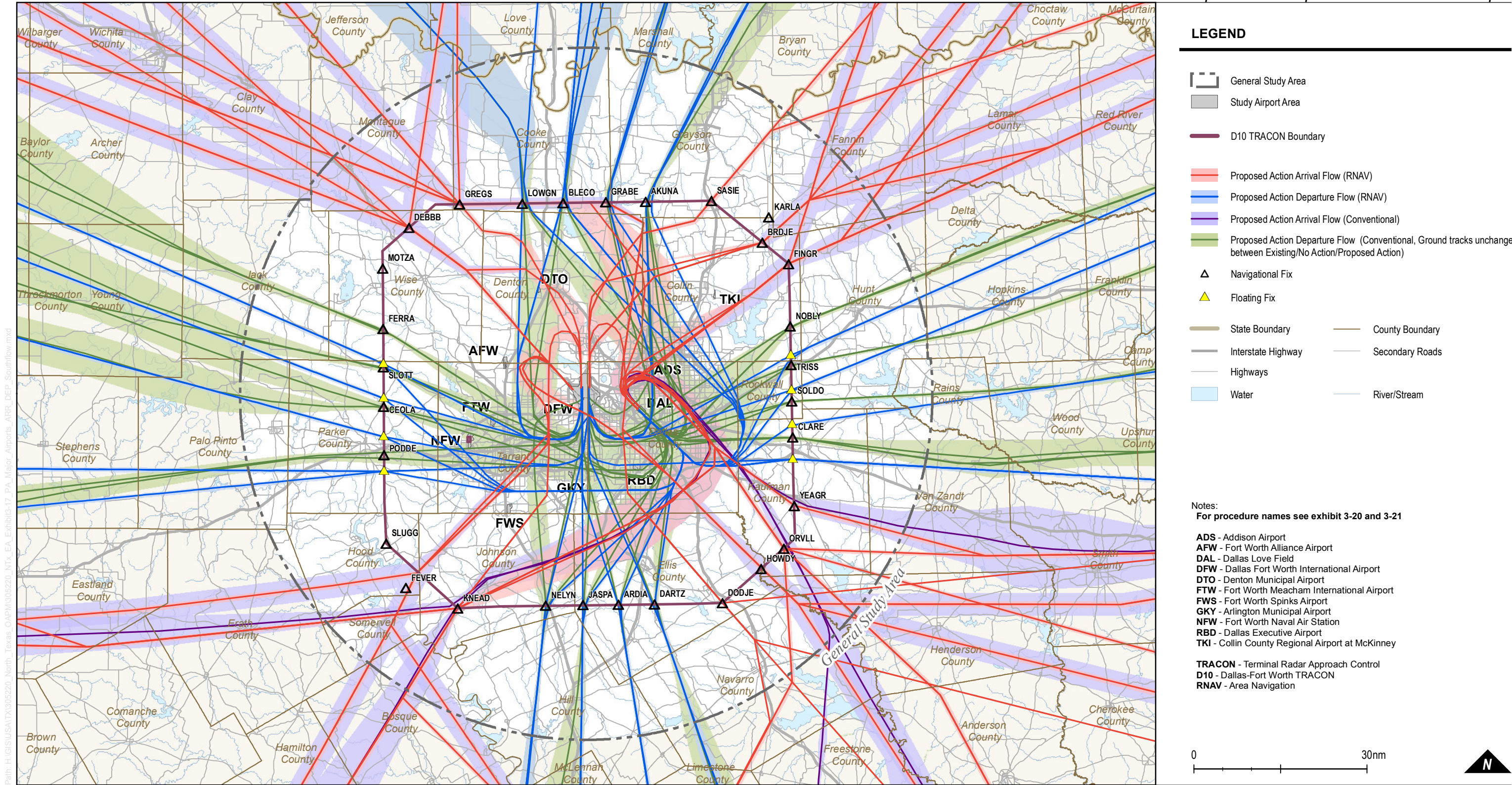
N/A – Not applicable

Sources:

MITRE Inc., July 2013

Prepared by:

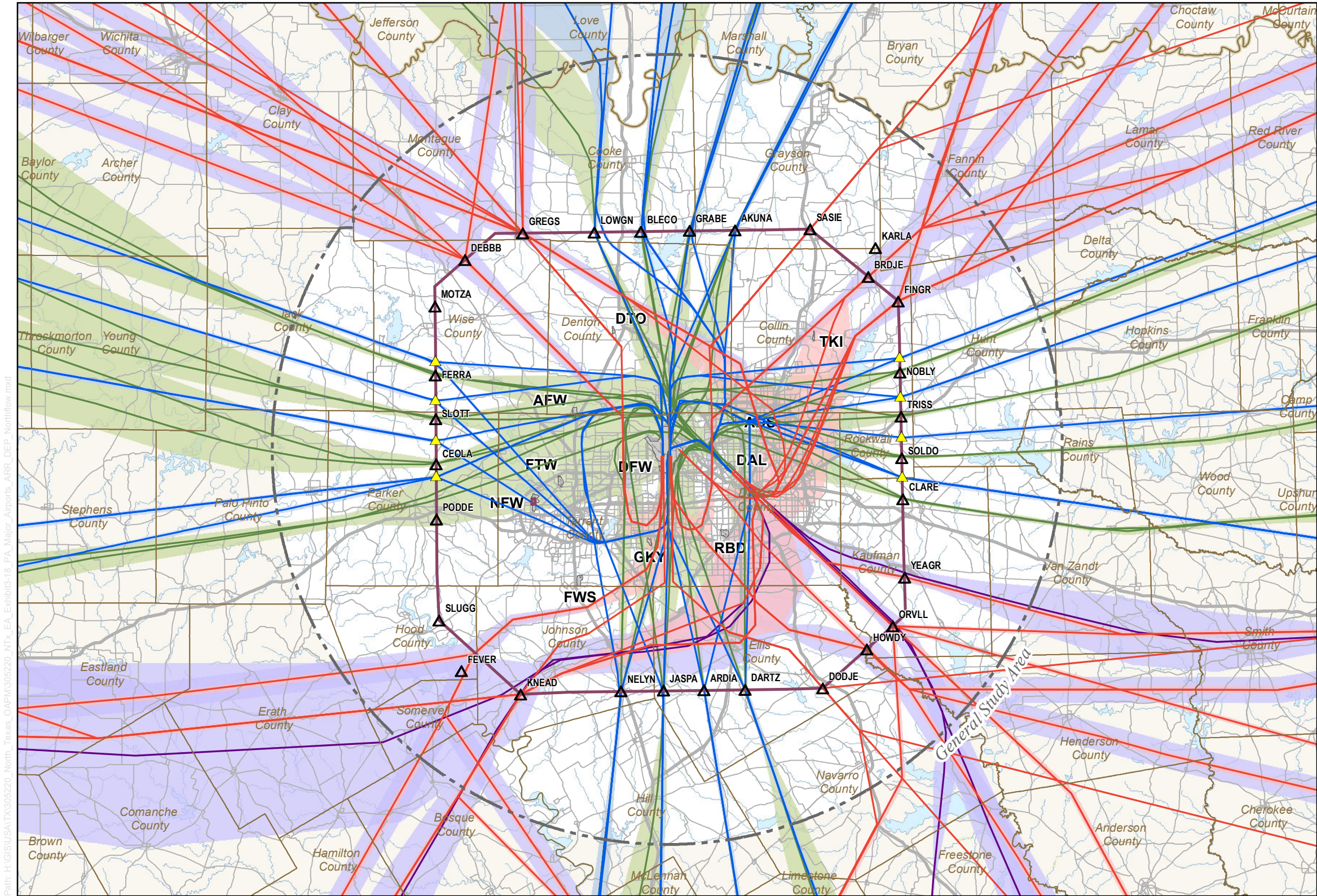
Harris Miller Miller & Harris Inc., July 2013



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-17

Proposed Action Alternative
Major Study Airports Arrivals and
Departures South Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Arrival Flow (RNAV)
- Proposed Action Departure Flow (RNAV)
- Proposed Action Arrival Flow (Conventional)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- Floating Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-22 and 3-23

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

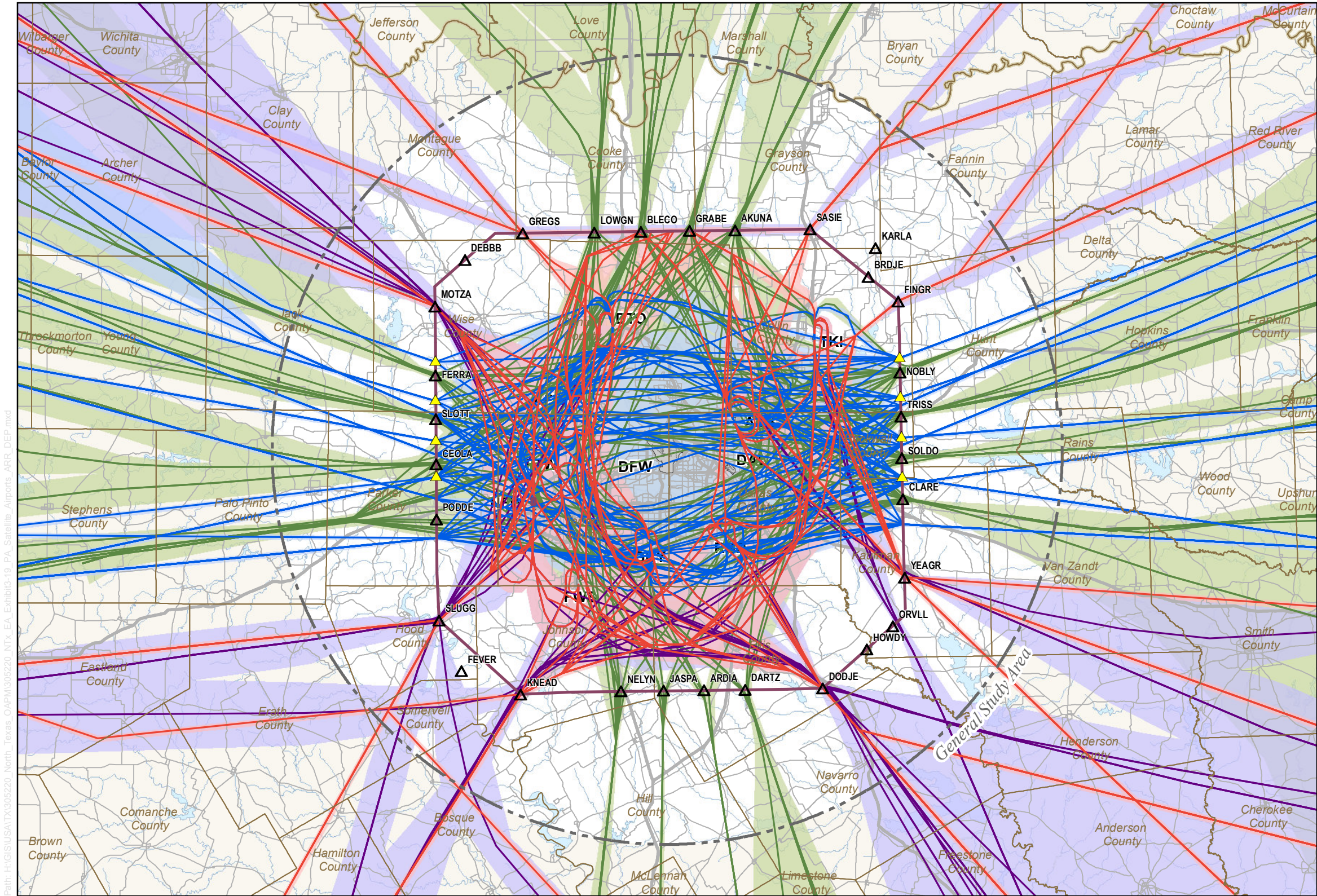
0 30nm



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-18

Proposed Action Alternative
Major Study Airports Arrivals and
Departures North Flow



LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Arrival Flow (RNAV)
- Proposed Action Departure Flow (RNAV)
- Proposed Action Arrival Flow (Conventional)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- Floating Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
For procedure names see exhibit 3-24 and 3-25

ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

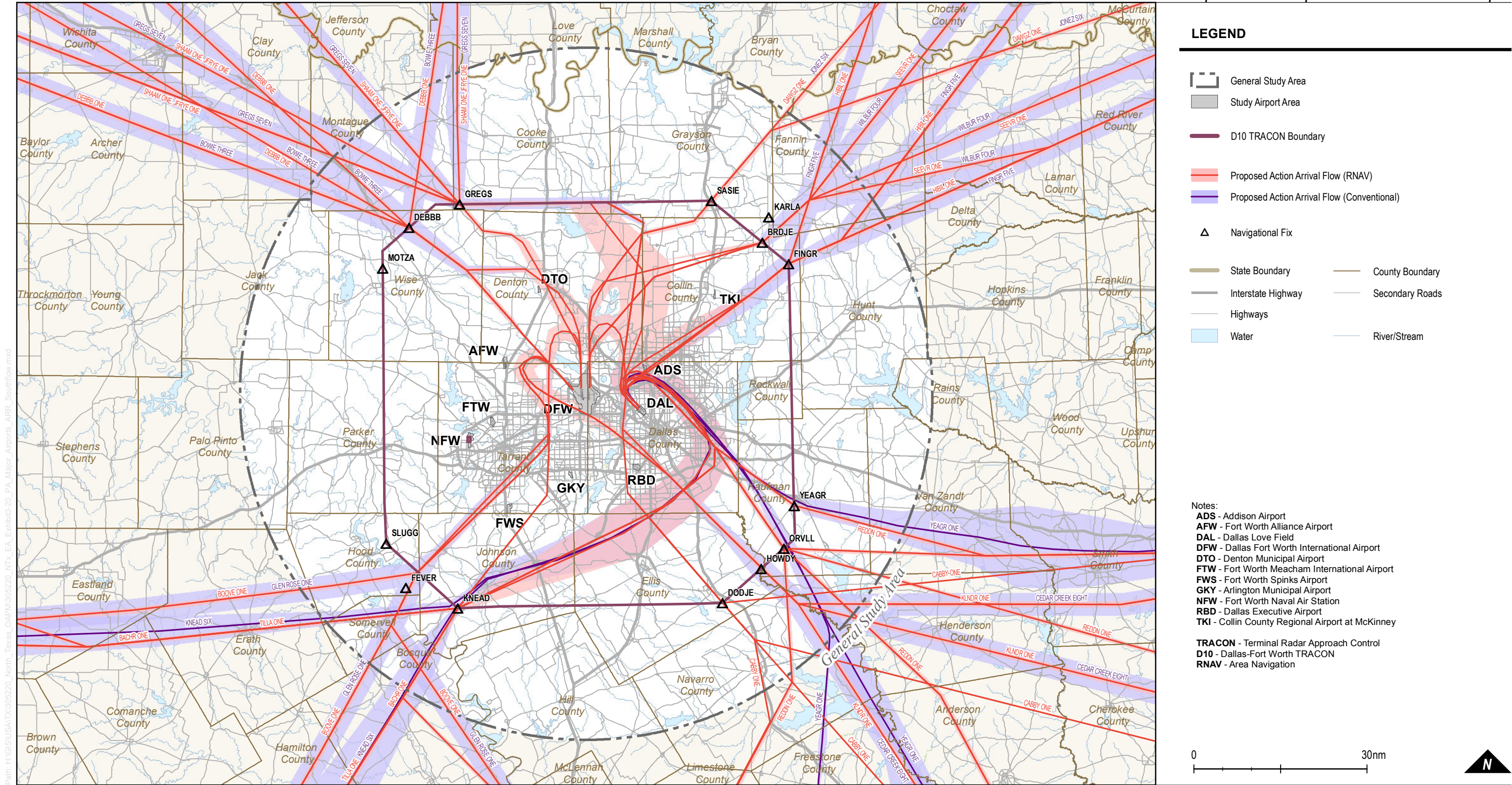
TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation

0 30nm

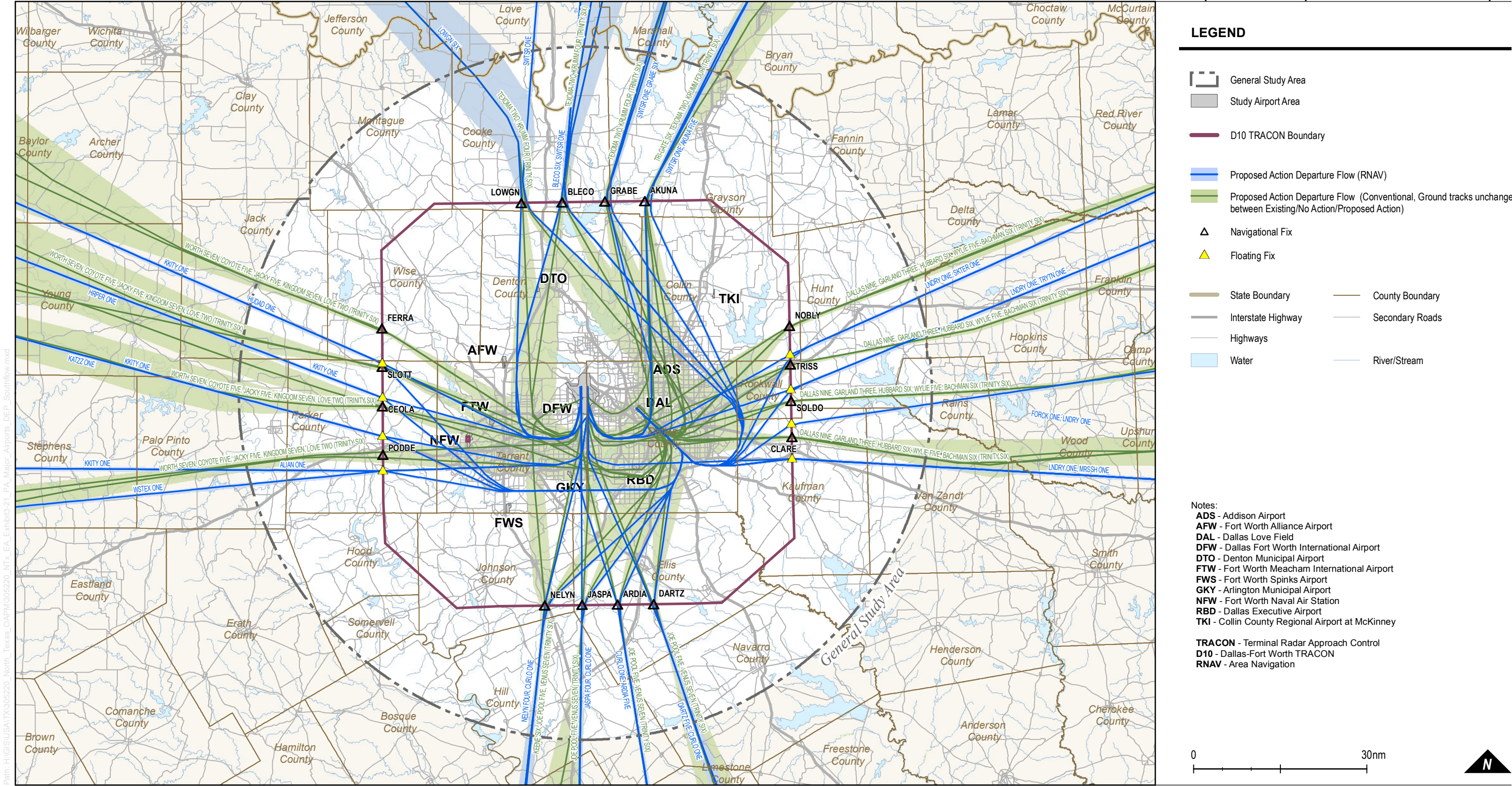


Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-19



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

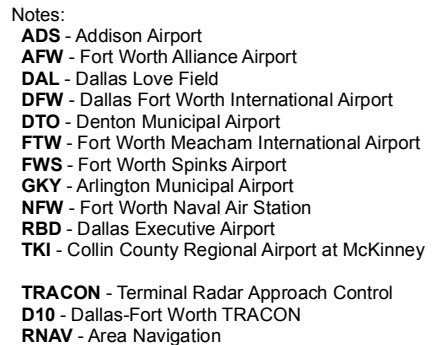
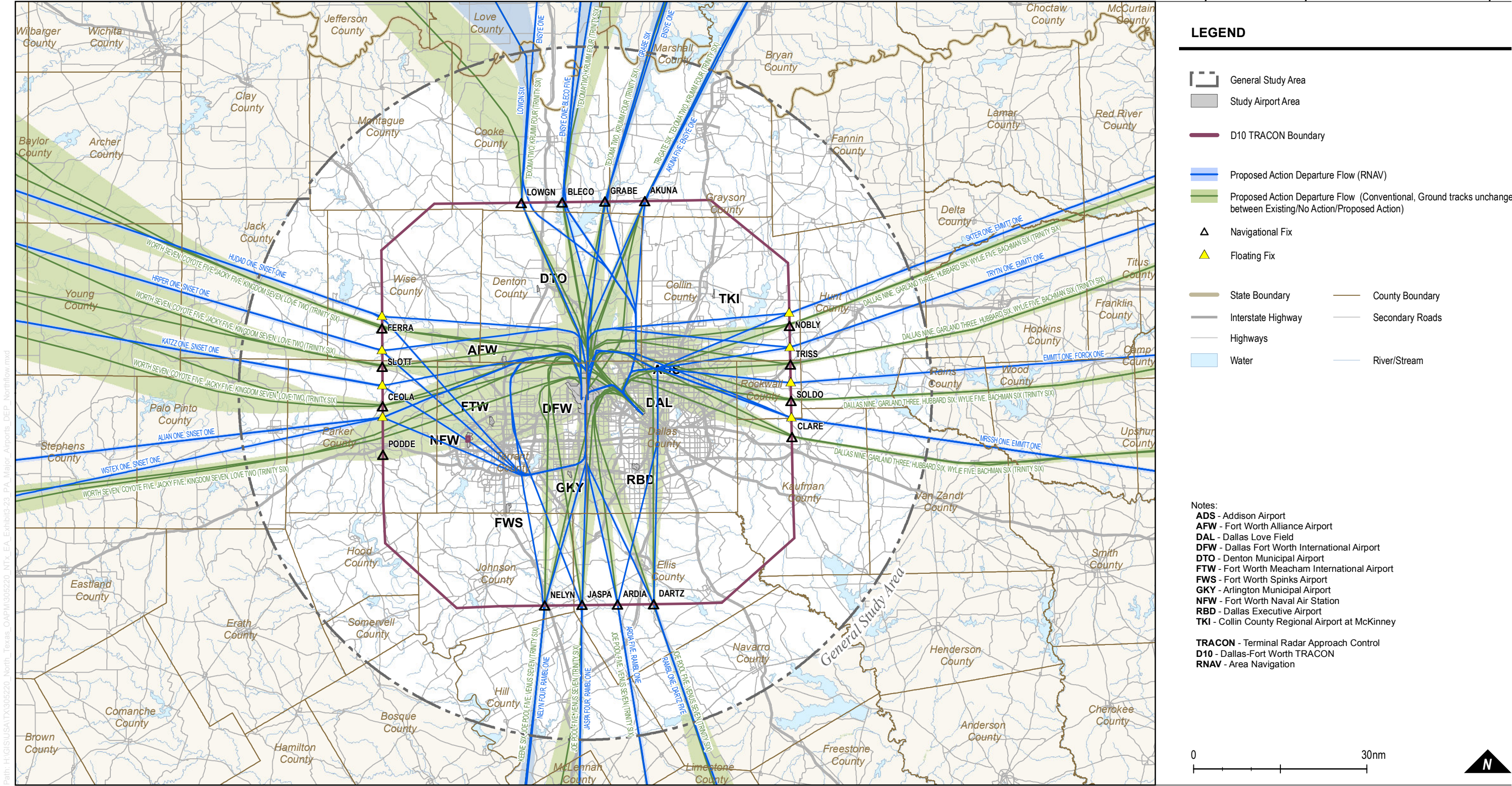
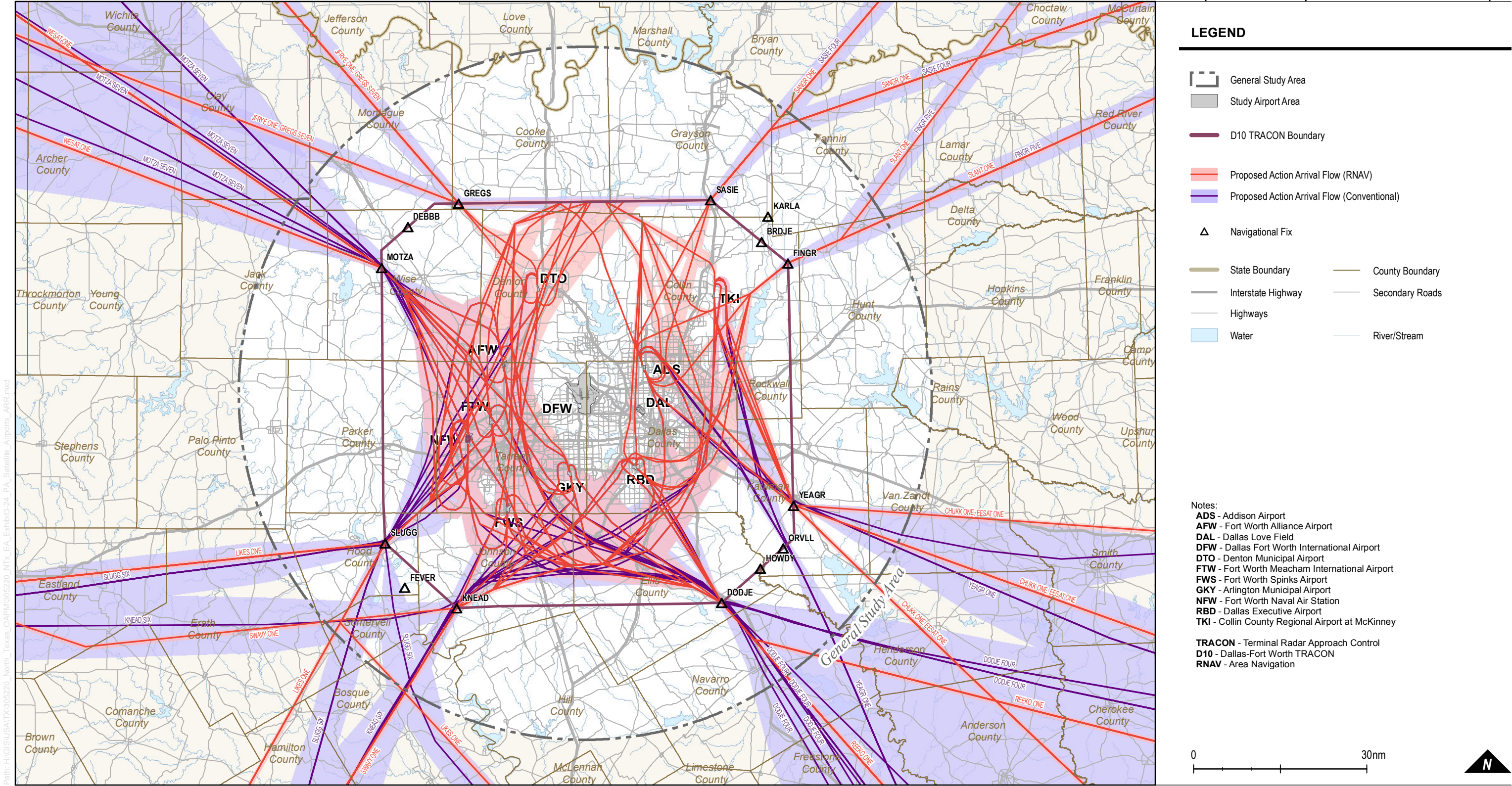


Exhibit 3-22



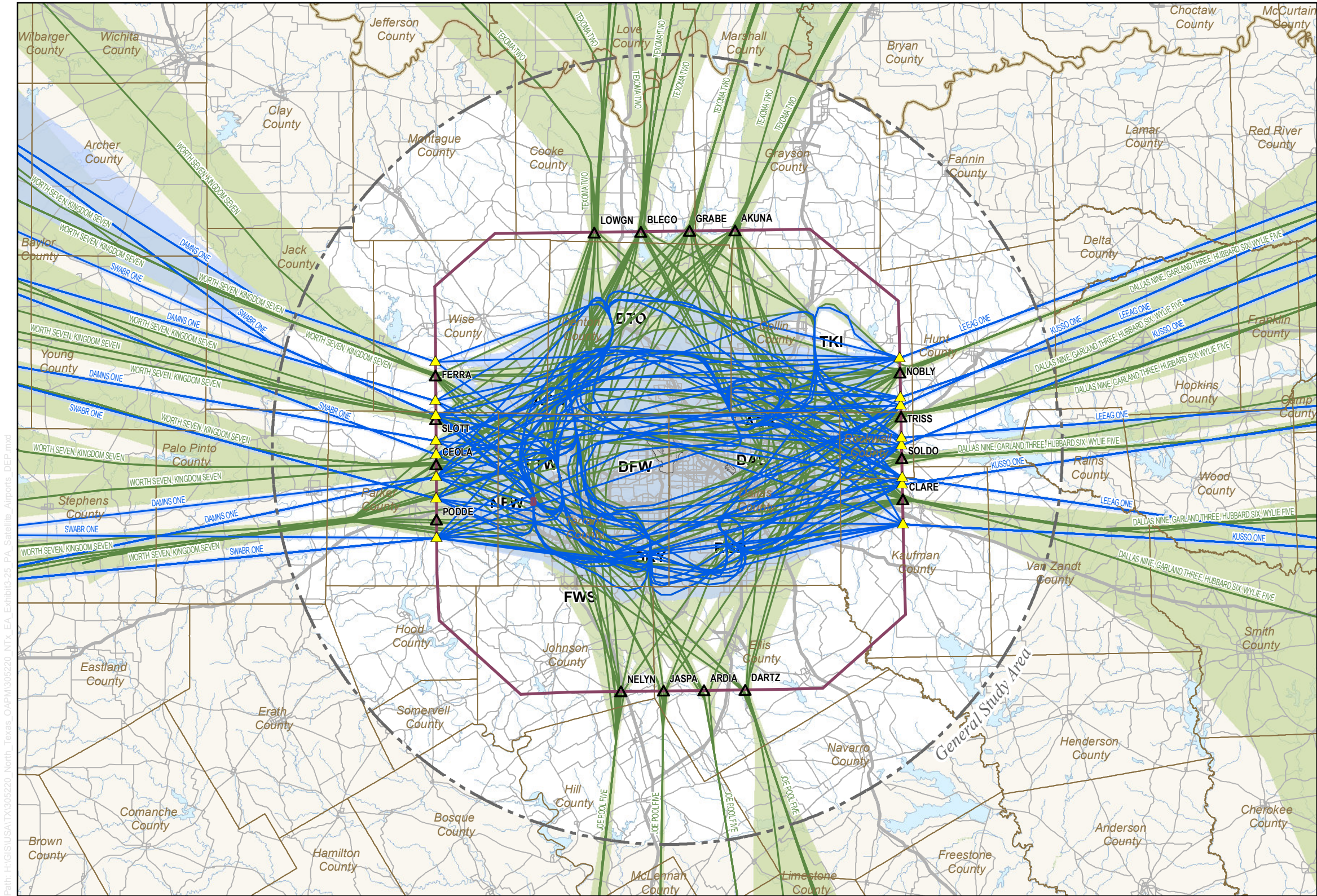
Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

Exhibit 3-24

Proposed Action Alternative
Satellite Study Airports Arrivals

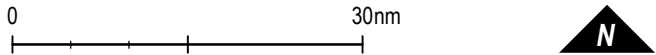


LEGEND

- General Study Area
- Study Airport Area
- D10 TRACON Boundary
- Proposed Action Departure Flow (RNAV)
- Proposed Action Departure Flow (Conventional, Ground tracks unchanged between Existing/No Action/Proposed Action)
- Navigational Fix
- Floating Fix
- State Boundary
- County Boundary
- Interstate Highway
- Secondary Roads
- Highways
- Water
- River/Stream

Notes:
ADS - Addison Airport
AFW - Fort Worth Alliance Airport
DAL - Dallas Love Field
DFW - Dallas Fort Worth International Airport
DTO - Denton Municipal Airport
FTW - Fort Worth Meacham International Airport
FWS - Fort Worth Spinks Airport
GKY - Arlington Municipal Airport
NFW - Fort Worth Naval Air Station
RBD - Dallas Executive Airport
TKI - Collin County Regional Airport at McKinney

TRACON - Terminal Radar Approach Control
D10 - Dallas-Fort Worth TRACON
RNAV - Area Navigation



Data Source: HMMH Analysis 2012 (Study Area Boundary); MITRE (TRACON Boundary); PDARS (Traffic Flow Data); digital - Terminal Procedures Publication (Navigation Fixes); National Atlas(Lakes/Rivers); Environmental Systems Research Institute, Inc.(State/County Boundaries, City Points, Roads, Airport Boundaries)
Prepared By: Harris Miller Miller & Hanson Inc., August 2013

3.3 Summary Comparison of the Proposed Action and No Action Alternative

This section provides a comparative summary between the Proposed Action and No Action Alternative based on the objectives defined in Section 2.2:

- Improve the flexibility in transitioning traffic between en route and terminal area airspace and between terminal area airspace area and the runways;
- Improve the segregation of arrivals and departures in terminal area and en route airspace; and
- Provide RNAV arrival and departure en route transitional and terminal area airspace procedures for each individual runway with the intent to provide a more predictable ground and vertical path.

3.3.1 Improve the Flexibility in Transitioning Aircraft

Section 2.2.1 includes two criteria established to measure the objective to increase the flexibility in transitioning aircraft between the terminal and en route airspace:

1. Where possible, increase the number of entry and exit points compared with the No Action Alternative (measured by number of exit/entry points).
2. Segregate major Study Airport traffic from other major Study Airport and/or satellite Study Airport traffic to/from Study Airports (measured by count of RNAV STARs and/or SIDs that can be used independently to/from Study Airports).

The efficient use of the North Texas Metroplex airspace would be improved by providing additional entry and exit points and segregating airport traffic. **Table 3-3** provides a summary comparison of the Proposed Action and No Action Alternative based on the first criteria defined above. The total number of entry and exit points overall would increase under the Proposed Action as compared to the No Action Alternative.

Therefore, the additional entry/exit points exclusive to some Study Airports indicate that the Proposed Action Alternative would achieve the objective to increase the flexibility in transitioning aircraft between the terminal airspace and the en route airspace. This would be expected to improve the efficiency of the air traffic routes in the North Texas Metroplex airspace.

The Proposed Action includes 67 RNAV STARs, SIDs, and RNP-ARs, 66 of which can be used independently to the Study Airports. The one remaining RNAV STAR serves both DAL and the East Satellite Airports. In comparison, the No Action Alternative includes 16 RNAV procedures, 16 of which can be used independently to the Study Airports. The increased number of independent RNAV STARs and SIDs under the Proposed Action indicates that this alternative would better achieve the objective of improving flexibility in transitioning aircraft within the North Texas Metroplex airspace.

Table 3-3 Alternatives Evaluation: Provide Flexibility in Transitioning Aircraft

| Criteria | No Action Alternative | Proposed Action |
|---------------------------------|-----------------------|-----------------|
| Entry Points | | |
| Shared with Other Airports | 10 | 7 |
| Exclusive to DFW | 3 | 4 |
| Exclusive to DAL | 0 | 0 |
| Exclusive to Satellite Airports | 1 | 2 |
| Total | 14 | 13 |
| Exit Points | | |
| Shared with Other Airports | 16 | 32 |
| Exclusive to DFW | 0 | 0 |
| Exclusive to DAL | 0 | 0 |
| Exclusive to Satellite Airports | 0 | 0 |
| Total | 16 | 32 |

Sources: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Harris Inc., July 2013.

Table 3-4 PBN Procedures Dedicated to Study Airports

| Airport | Type | No action (Today) | Proposed action |
|--------------------------------|-----------|-------------------|-----------------|
| Dedicated to DFW | RNAV SID | 16 | 17 |
| | RNAV STAR | 0 | 16 |
| Dedicated to DAL | RNAV SID | 0 | 8 |
| | RNAV STAR | 0 | 7 |
| | RNP-AR | 0 | 6 |
| Dedicated to SATs Airports | RNAV SID | 0 | 4 |
| | RNAV STAR | 0 | 8 |
| Dedicated to DAL and East SATs | RNAV STAR | 0 | 1 |
| Total: | | 16 | 67 |

Source: MITRE Inc., July 2013
Prepared by: Harris Miller Miller & Hanson Inc., July 2013

3.3.2 Segregate Arrival and Departure Flows

In Section 2.2.2 one criterion was established to measure the objective to segregate traffic in portions of the airspace where arrival and departure flows cross, converge, or are within proximity of each other:

- Where possible, increase the number of RNAV STARs and SIDs compared with the No Action Alternative (Measured by total count of RNAV STARs and RNAV SIDs for the North Texas Metroplex.)

The Proposed Action includes 67 RNAV STARs/SIDs and 6 RNP-ARs. In comparison, the No Action Alternative includes 16 RNAV procedures. Therefore, the additional RNAV

STARs/SIDs included under the Proposed Action indicates that this alternative would achieve the objective of better segregating air traffic in the North Texas Metroplex airspace.

3.3.3 Improve Predictability of Air Traffic Flow

In Section 2.2.3, two criteria were established to measure the objective to improve the predictability of air traffic flow in the North Texas Metroplex airspace:

- Ensure that the majority of STARs and SIDs to and from the Study Airports are based on RNAV technology (measured by count of RNAV STARs and SIDs for an individual Study Airport); and
- Increase the number of runway transitions in the RNAV STARs and SIDs in comparison to the No Action Alternative (measured by count of procedures that include runway transitions to/from runways).

RNAV procedures provide for a predictable flow of air traffic and require less controller-to-controller and controller-to-pilot communications to manage air traffic flows through the airspace. Predictability in the North Texas Metroplex can be further improved by increasing the number of runway transitions and altitude-controlled points defined in the RNAV STARs and SIDs. An increase in the number and use of routes defined by RNAV procedures, especially those that include runway transitions, RNP-AR procedures, and/or altitude-controlled points, would be expected to decrease the number of controller-to-controller and controller-to-pilot communications. An increase in the number of runway transitions and procedures with altitude controls defined in the RNAV procedures would be expected to improve air traffic controllers' ability to more effectively serve all of the runways at the Study Airports and balance demand across the North Texas Metroplex while maintaining a predictable flow of air traffic.

Table 3-5 provides a summary comparison of the percentage of procedures based on RNAV technology under the Proposed Action and No Action Alternative; the total number of routes; and the number of RNAV procedures with altitude controls.

The majority of procedures under the Proposed Action Alternative would be RNAV STARs/SID and RNP-ARs, representing 70 percent of the total number of procedures compared to 32 percent under the No Action Alternative. Overall, the number of routes that transition from/to an entry/exit point to/from a runway end for the Proposed Action Alternative would increase over the No Action Alternative. Therefore, the Proposed Action Alternative would be expected to provide more predictability requiring less controller-to-controller and controller-to-pilot communications as compared to the No Action Alternative.

Based on the criteria above, the Proposed Action Alternative would provide a total of 67 RNAV STARs/SIDs and RNP-ARs in the North Texas Metroplex airspace compared to the 16 RNAV SIDs provided in the No Action Alternative. This represents a 419 percent increase in the number of RNAV procedures. With the increased number of predictable routes, the Proposed Action would provide better segregation of arrival and departure flows in comparison to the No Action Alternative.

Table 3-5 Alternatives Evaluation: Improve Predictability of Air Traffic Flow

| Criteria | No Action Alternative | Proposed Action |
|--|------------------------------|------------------------|
| Arrival Procedures | | |
| Number of RNAV STARs | 0 | 32 |
| Total Arrival Procedures | 17 | 44 |
| Percent RNAV STARs of Total | 0% | 73% |
| Number of Runway Ends Served with RNP-AR Approach Procedures | 0 | 6 |
| Number of Altitude Control Points | 1 | 298 |
| Departure Procedures | | |
| Number of RNAV SIDs | 16 | 29 |
| Total Departure Procedures | 32 | 45 |
| Percent RNAV SIDs of Total | 50% | 64% |
| Number of Combinations of Runway Ends and Exit Points Served by Runway Transitions in the RNAV SIDs for all Study Airports | 16 | 24 |

Notes:

Blue Shading = indicates alternative that achieves desired criteria.

Sources: MITRE Inc., July 2013

Prepared by: Harris Miller Miller & Harris Inc., July 2013

3.4 Preferred Alternative

Of the two alternatives carried forward for analysis, the Proposed Action would better meet the Purpose and Need for the North Texas OAPM project based on the criteria discussed above. Therefore, the Proposed Action is the Preferred Alternative. Although it would not meet the Purpose and Need, the No Action Alternative was carried forward, as required by CEQ regulations, to establish a benchmark against which decision makers can compare the magnitude of environmental effects of undertaking the Proposed Action.

3.5 Listing of Federal Laws and Regulations Considered

Table 3-6 lists the relevant federal laws and statutes, Executive Orders, and regulations applicable to the Proposed Action and the No Action Alternative and considered in preparation of this EA.

Table 3-6 List of Federal Laws and Regulations Considered – NTX OAPM EA (1 of 3)

| Federal Laws and Statutes | Citation |
|--|----------------------------------|
| National Environmental Policy Act of 1969 | 42 U.S.C. § 4321 <i>et seq.</i> |
| Clean Air Act of 1970, as amended | 42 U.S.C. § 7401 <i>et seq.</i> |
| Department of Transportation Act of 1966, Section 4(f) | 49 U.S.C. § 303(c) |
| Aviation Safety and Noise Abatement Act of 1979 | 49 U.S.C. § 47501 <i>et seq.</i> |
| Federal Aviation Act of 1958, as amended | 49 U.S.C. § 40101 <i>et seq.</i> |
| Endangered Species Act of 1973 | 16 U.S.C. § 1531 <i>et seq.</i> |
| Fish and Wildlife Coordination Act of 1958 | 16 U.S.C. § 661 <i>et seq.</i> |
| The Bald and Golden Eagle Protection Act of 1940 | 16 U.S.C. § 668 <i>et seq.</i> |

Federal Laws and Statutes

| | Citation |
|--|--------------------------|
| Lacey Act of 1900 | 16 U.S.C. § 3371 et seq. |
| Migratory Bird Treaty Act of 1918 | 16 U.S.C. § 703 et seq. |
| National Historic Preservation Act of 1966, as amended | 16 U.S.C. § 470 |
| Archaeological and Historic Preservation Act of 1974, as amended | 16 U.S.C. § 469 et seq. |
| American Indian Religious Freedom Act of 1978 | 42 U.S.C. § 1996 |
| The Historic Sites Act of 1935, as amended | 16 U.S.C. § 461-467 |

Table 3-6 List of Federal Laws and Regulations Considered – NTX OAPM EA (2 of 3)

Executive Orders

| | Citation |
|--|-------------------------------|
| 11593, Protection and Enhancement of the Cultural Environment | 36 Federal Register (FR) 8921 |
| 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations | 59 FR 7629 |
| 13045, Protection of Children from Environmental Health Risks and Safety Risks | 62 FR 19885 |

Federal Regulations

| | Citation |
|--|----------------------------------|
| Council for Environmental Quality Regulations | 40 C.F.R. Part 1500 to Part 1508 |
| General Conformity Regulations | 40 C.F.R. Part 93 Subpart B |
| Protection of Historic Properties Regulations | 36 C.F.R. 800 |
| Airport Noise Compatibility Planning Regulations | 14 C.F.R. Part 150 |
| Federal Aviation Regulations (FAR) Part 71: Designation of Class A, Class B, Class C, Class D, and Class E Airspace Areas; Airways; Routes; and Reporting Points, December 17, 1991. | 41 C.F.R. Part 71 |

Table 3-6 List of Federal Laws and Regulations Considered – NTX OAPM EA (3 of 3)

FAA/U.S. Department of Transportation Orders

| |
|---|
| U.S. DOT Order 5680.1: <i>Final Order to Address Environmental Justice in Low-Income and Minority Populations</i> , April 14, 1997. |
| FAA Order 1050.1E, Chng. 1: <i>Environmental Impacts: Policies and Procedures</i> , March 20, 2006. |
| FAA Order 7100.9D, <i>Standard Terminal Arrival Program and Procedures</i> , December 15, 2003. |
| FAA Order 8260.3B, Change 20, <i>United States Standard for Terminal Instrument Procedures (TERPS)</i> , December 7, 2007. |
| FAA Order 8260.40B, <i>Flight Management System (FMS) Instrument Procedures Development</i> , December 31, 1998. |
| FAA Order 8260.44A, Change 2, <i>Civil Utilization of Area Navigation (RNAV) Departure Procedures</i> , November 6, 2006. |
| FAA Order 8260.46D, <i>Departure Procedure (DP) Program</i> , August 20, 2009. |
| FAA Order 8260.48, <i>Area Navigation (RNAV) Approach Construction Criteria</i> , April 8, 1999. |
| FAA Order 8260.52, <i>United States Standard for Required Navigation Performance (RNP) Approach Procedures with Special Aircraft and Aircrew Authorization Required (SAAAR)</i> , June 3, 2005. |
| FAA Order 8260.54A, <i>The United States Standard for Area Navigation (RNAV)</i> , December 7, 2007. |
| FAA Order JO 7110.65U, <i>Air Traffic Control</i> , February 9, 2012. |